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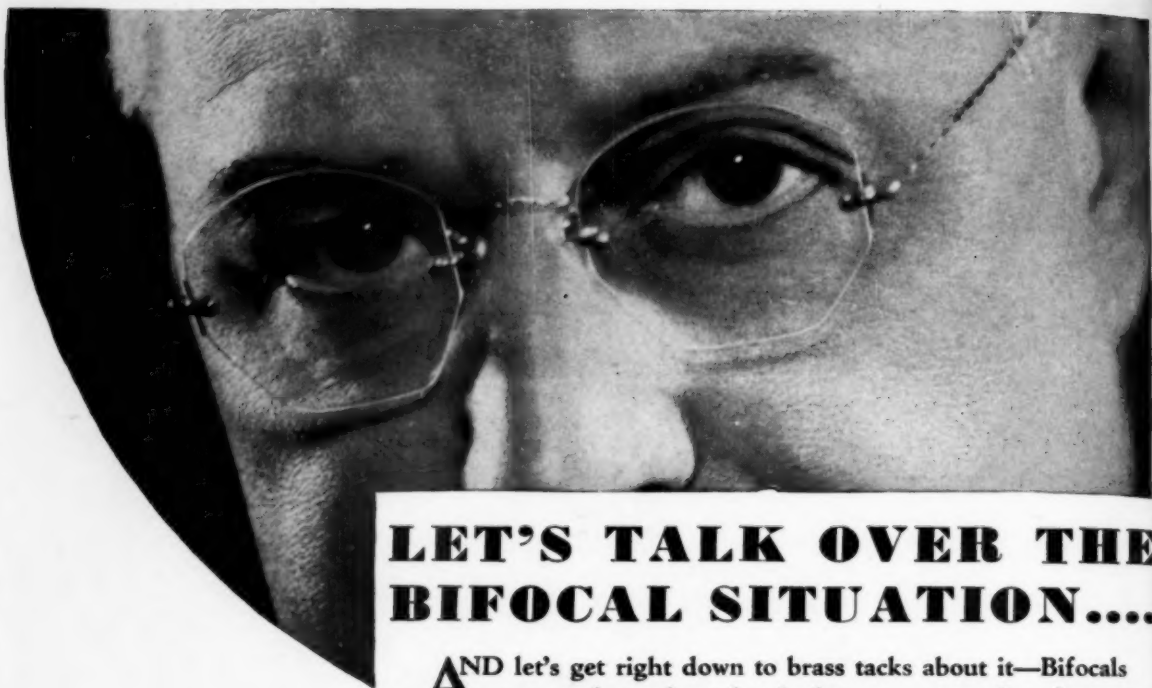
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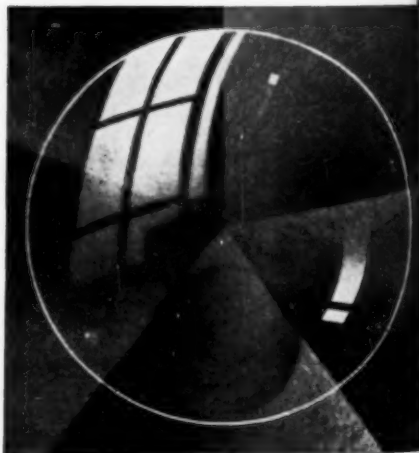
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AMERICAN JOURNAL OF OPHTHALMOLOGY

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EXPERIMENTAL GRANULAR CONJUNCTIVITIS IN MONKEYS INDUCED BY BACTERIUM GRANULOSIS

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DENVER

A résumé of results obtained by leading students of trachoma in experimental inoculation of *M. rhesus* monkeys with *B. granulosis* is given. Four of five monkeys in which folliculosis was produced by the author yielded *B. granulosis*. The disease differs from human trachoma mainly in the absence of pannus. The author concludes that etiologic relationship of this organism to human trachoma can never be established by monkey experimentation. From the Departments of Ophthalmology and Bacteriology. University of Colorado School of Medicine.

In 1928 Noguchi¹ described the isolation of a small rodshaped microorganism, which he named *Bacterium granulosis*, from cases of trachoma in Indians. Subconjunctival inoculation with pure cultures produced in certain species of monkeys a chronic granular conjunctivitis bearing a close resemblance to human trachoma. The disease started, after an incubation period of from two to three weeks, as an edema and congestion of the conjunctiva at the upper border of the tarsus, followed later by follicle formation at first limited to the upper fornix but later spreading to the lower fornix and finally involving both tarsi. Scar formation was observed both clinically and microscopically although in no animal did gross lid deformity result. Pannus did not occur. The disease frequently spread to the uninoculated eye and could be transmitted to normal animals by tissue transfer. The specific bacterium was recovered from the disease as early as the 49th day and as late as the 204th after inoculation. It was also recovered from animals of the first and second tissue passages. From the evidence thus established Noguchi concluded that *Bacterium granulosis* was the incitant of granular conjunctivitis in monkeys and its equivalent, trachoma, in man.

The production of similar lesions in monkeys with *Bacterium granulosis* has been reported by Tilden and Tyler², Finnoff and Thygeson³, Olitsky and Tyler⁴, and Olitsky, Knutti, and

Tyler⁵. A strain of *Bacterium granulosis* isolated by Addario⁶ in Palermo and tested on monkeys at the Rockefeller Institute proved to be specifically pathogenic for rhesus monkeys. The production of mild lesions not capable of differentiation from the folliculosis occurring spontaneously in monkeys has been reported by Weiss⁷. On the other hand, numerous investigators throughout the world have reported consistently negative results after inoculation of monkeys with strains of *Bacterium granulosis* obtained from the Rockefeller Institute and other sources.

The ensuing report comprises a record of the continuation of earlier studies of experimental granular conjunctivitis made in association with W. C. Finnoff, and a summary of the work which has been done on this subject up to the present time.

Normal conjunctiva of *Macacus rhesus* monkey

The normal conjunctiva of the *Macacus rhesus* is devoid of all inflammatory signs. The tarsal conjunctiva appears pale, smooth, and glistening, with the glands of Meibomius showing through as slightly yellowish radial markings. The inter-Meibomian vessels can be made out only with difficulty. At the upper border of the tarsus the conjunctiva takes on a pinker color due to increased vascularization, and in this location an occasional small collection

of lymphoid tissue is seen, identical with that so frequently occurring in the human eye.

The conjunctiva of the upper cul-de-sac is also diffusely pink but is smooth and glistening with an occasional large

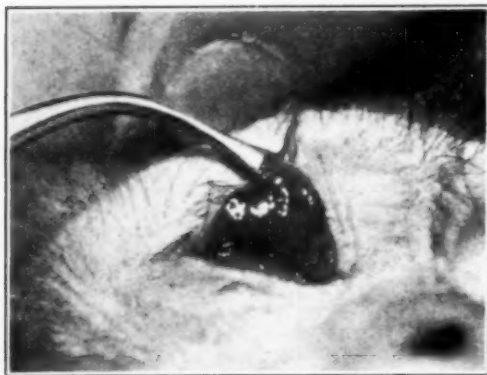


Fig. 1 (Thygeson). Right eye *M. rhesus* no. 8, showing marked tarsal involvement.

vessel showing through. The membrane again pales out in its bulbar portion, which is characterized by the presence of rather large irregular deposits of brownish pigment. The limbus is not elevated and the conjunctival vessels appear to stop abruptly without penetrating the cornea.

The conjunctiva of the lower lid corresponds to that of the upper except that over the tarsus the membrane is not so characteristically white and glistening. The caruncle and semilunar fold appear as in the human eye.

Experimental conjunctivitis induced by *Bacterium granulosis*

Infection has been produced both by subconjunctival injection at the upper border of the tarsus and by simple instillation of cultures followed by light scarification. The two methods seem equally effective. Only recently isolated strains appear infective and loss in virulence seems associated with the development of certain biologic properties such as pigment formation and the ability to grow luxuriantly on ordinary laboratory media. No correlation between dissociated forms and virulence has been noted as both R and S forms

from old strains appear uniformly attenuated. I have previously commented on⁸ the difficulties of obtaining initial infection with cultures and the later ease with which the disease may be transferred by tissue and secretions. It is probable that a very definite change or adaptation of the virus to the monkey conjunctiva does occur.

The incubation period varies from one to three weeks. Longer incubation periods reported in a previous communication³ are, in the light of new evidence, probably erroneous. At that time the importance of strict isolation procedures was not recognized and it is probable that contact infection, first described by Tyler⁹, accounted for the occurrence of these late infections. Recent experiments, strictly controlled, have shown that first manifestations of the disease appear in from seven to twenty-one days after inoculation, the average length of time being about twelve days. The incubation period after tissue transfer is rather constantly about ten days.

It has been possible to make a careful study of initial lesions in a number of cases. Irrespective of the mode

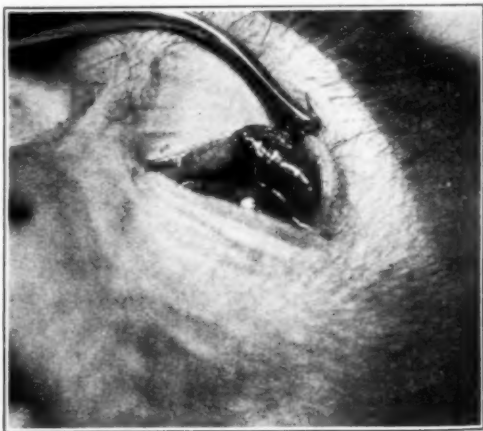


Fig. 2 (Thygeson). Left eye *M. rhesus* no. 8, showing tarsal involvement.

of inoculation the disease appears to start in the upper cul-de-sac near the upper border of the tarsus as a localized hyperemia and edema of the conjunctiva which is followed in from five to seven days by the appearance of a

number of small follicles which gradually increase in size and in a few weeks involve the entire fornix. About this time the lower cul-de-sac becomes similarly involved, with follicles extending well over the lower tarsus. The lesions, however, are never as advanced as in the upper cul-de-sac. The upper tarsus is involved only late in the disease and certain cases may present a very severe cul-de-sac disease with little or no tarsal change. Ordinarily, however, the lesions gradually encroach on the tarsus from above and from the sides as a papillary hypertrophy followed by follicle formation. The follicles are small and scattered and this feature is never conspicuous. In severe cases such as *M. rhesus* 8 (Figs. 1 and 2) the tarsus may become markedly inflamed and thickened, but this has occurred in only three animals. Later in the disease small translucent follicles, unaccompanied by inflammatory signs, appear on the bulbar conjunctiva (Fig. 3), becoming fewer in number toward the limbus. Larger follicles have been seen on the caruncle and semilunar fold. The region of the upper limbus has been carefully examined under magnification but in no

cul-de-sac has been filled with large, gelatinous, confluent follicles (Fig. 4) which can be expressed easily and which appear indistinguishable from trachoma follicles of stage T2a (MacCallan's classification). Other cases



Fig. 4 (Thygeson). Left eye *M. rhesus* no. 9, showing extensive cul-de-sac lesions.

(Fig. 3) have presented smaller follicles having a decided tendency to bleed on the slightest traumatization. These are harder, more opaque, and less easily expressible. A smaller follicle when examined with the low power of the corneal microscope usually showed a capillary ramifying on its surface. No follicles have been observed to rupture spontaneously.

A marked tendency to new vessel formation is seen, particularly on the tarsus in old cases where large trunks running obliquely from the upper border to the free surface are common. These may persist after healing has occurred.

Scarring, though never very prominent, has occurred in a sufficient number of cases to rule out the possibility of error. It has developed in eyes infected by contact and in which there has been no traumatism. (In all animals the left eye has been untouched, tissue and scrapings being taken from the right.) In three cases a distinct incurvation of the tarsus has been observed, but in only one did there appear to be sufficient tarsal scarrings to account for it. It is doubtful if much importance can be attached to this sign.



Fig. 3 (Thygeson). Right eye *M. rhesus* no. 9. Smaller follicles in cul-de-sac. Bulbar follicles.

animal could evidences of limbal infiltration or incipient pannus, so characteristic of human trachoma, be seen.

Several types of follicles have been observed. In several cases the upper

Ptosis has also been observed in a few instances where tarsal involvement has occurred. In these cases it is probable that the factor concerned is an increased weight of the lid as in microscopic sections the infiltration has not extended deep enough to involve the superior tarsal muscle.

A definite tendency of the experimental disease to fluctuate in intensity has been observed. A conjunctiva apparently healed has been seen suddenly to become again involved. In this there is a very definite similarity to the clinical course of human trachoma.

Spontaneous folliculosis

The fact that chimpanzees and lower monkeys suffer from a spontaneous granular conjunctivitis has been known for many years and naturally presents a serious obstacle to the proper interpretation of results of experimental inoculations. According to Hess and Römer¹⁰, who were among the first to comment on this condition, the virus is infectious for both man and normal monkey and passes spontaneously from one eye to the other but never affects the tarsus.

An excellent summary of the subject has been given recently by Wilson¹¹ who examined fifteen monkeys of different species in the Zoological Gardens at Cairo and found that twelve of these had definite conjunctival follicles. He distinguished two distinct types of follicle appearance. The first presented follicles scattered irregularly over both palpebral and bulbar conjunctiva but avoiding the tarsus and without signs of any adjacent inflammatory process. The follicles of this type varied in size but were usually small, hard, translucent elevations, freely movable over the subconjunctival tissue. They showed no tendency to break down or rupture and might be regarded as normal enlargements of lymphoid nodules normally present in the conjunctiva. Descriptive plates in color accompany his article.

The second type was one in which, in addition to the follicles, there were also signs of an inflammatory process

in the conjunctiva. In these cases, in contradistinction to the former type, the manipulation of the conjunctiva incident to examination produced a distinct flushing which was followed by a free mucoid discharge. The follicles in these cases were usually larger than in the former type and were relatively very large as compared with the follicles found in the human conjunctiva. They were translucent and yellowish in color and showed evidence of associated inflammation. Upon manipulation there was a tendency for small hemorrhages to appear in them. These also, however, showed no sign of rupturing or breaking down on pressure. There were no follicles on the tarsus, no necrotic follicles, no scars, pannus, or pits. Histological examination of an excised bit of conjunctiva showed a few well-defined lymphoid follicles. These were made up of densely crowded lymphocytes and had little or no supporting stroma. In the midst of the small lymphoid cells were isolated collections of the larger and paler cells corresponding to those of the germinal center in a lymph gland. The surface epithelium had disappeared at the summit of the follicles and showed swollen balloon-like cells near the follicles. There was also a mild sub-epithelial infiltration of plasma cells and lymphocytes, the latter being the more abundant.

Wilson was unable to bring out any eruption of follicles by manipulation alone, although it is to be remembered that Nicolle and Lumbroso¹² in 1926 reported the production of similar follicles after scarification of the palpebral conjunctiva of one eye. Without interference a similar crop of follicles occasionally appeared shortly afterwards in the other eye. They also showed that by inoculation of materials from these follicles, fresh follicles could be induced in rabbits and other monkeys.

My experience with spontaneous folliculosis has been limited, as the *Macacus rhesus* with which I have been working appears to be relatively insusceptible to this disease. In only three animals have gross follicles been



Fig. 5 (Thygeson). Severe spontaneous lesions of upper cul-de-sac with mucoid degeneration of epithelium.

observed and these have been small hard elevations without inflammation located in the upper cul-de-sac and corresponding to the first type described by Wilson. Attempts to transmit these follicles to normal animals have been unsuccessful, and traumatism failed to produce any increase in their number. Isolation of these animals under good hygienic conditions has resulted in a rather rapid absorption of the follicles and a resultant smooth conjunctiva. That this species of monkey can present a rather severe spontaneous disease appears certain since other workers, particularly Olitsky¹³ at the Rockefeller Institute and Weiss¹⁴ at Washington University, have reported marked folliculosis with decided inflammatory signs. On the other hand, Olitsky¹⁵ has recently reported an inspection of over 250 monkeys which failed to reveal a single case of spontaneous folliculosis.

With the idea of investigating the possibilities of a spontaneous folliculosis occurring in animals previously found normal, I isolated three animals for periods of ninety days each. Examination at weekly intervals showed at no time anything but pale, smooth

conjunctivæ. These animals were later used for tissue transfer experiments and reacted readily to inoculation with typical granular lesions.

The bacteriology of spontaneous folliculosis has been studied recently by Olitsky and his coworkers¹⁶. They failed to recover *Bacterium granulosis* from eleven monkeys showing the disease and also report that cross-immunity does not exist between spontaneous folliculosis and the experimental disease induced by inoculation with *Bacterium granulosis*.

Through the kindness of Dr. Rowland P. Wilson I have been able to study microscopic sections of a single case of severe spontaneous folliculosis in a monkey whose species I do not know. Sections through the upper cul-de-sac show a severe sub-epithelial infiltration with lymphocytes and plasma cells (Fig. 5). Large confluent follicles are present which are indistinguishable in character from those of the disease induced by *Bacterium granulosis*. The epithelium shows a very large number of goblet cells and the tendency to pseudo-gland formation is marked. No fibroblastic proliferation is seen. The sections unfortu-

nately do not include the tarsus so that the condition of this structure cannot be determined.

Immunological experiments

It has been possible to develop immune sera of high titer by intravenous inoculation of rabbits with living cultures of *Bacterium granulosus*. Sera from eight monkeys infected with *Bacterium granulosus*, when tested against both homologous and heterologous strains of this organism, have, however, failed to show agglutinins even in dilutions as low as 1:10. In two of the animals whose sera were tested, *Bacterium granulosus* was recovered from the conjunctival lesions by culture, which would seem to indicate that localized infection with this organism is insufficient to cause the appearance of agglutinins in the blood serum.

Two attempts have been made to vaccinate monkeys locally by subconjunctival injections of *Bacterium granulosus* antigen. In both cases killed suspensions of *Bacterium granulosus* in 0.5 cc. amounts were injected subconjunctivally at the upper border of the tarsus of the right eye at weekly intervals for six weeks. One week later both eyes of each animal were inoculated with tissue from infected monkeys and after an incubation period of approximately twelve days, typical infection resulted. There was no difference in susceptibility between the vaccinated and unvaccinated eyes.

A similar experiment was performed in three monkeys which had resisted repeatedly subconjunctival inoculations with living cultures of *Bacterium granulosus*. When inoculated with tissue from infected animals, typical infection resulted. A third experiment exactly similar has recently been reported by Wilson¹⁶ and it would seem that sufficient evidence has accumulated to show rather conclusively that vaccination does not protect against experimental infection by tissue transfer.

Epithelial smears

A large number of epithelial smears have been made from the monkey le-

sions in various stages of the disease. These have been made with a small platinum spatula according to the method described by Lindner. Both dry and wet fixation have been used and the staining has been either with Giemsa or with Lindner's contrast stain.

With the possible exception of one case (*M. rhesus* 11), no intracellular structures have been seen which could be positively identified as inclusion bodies of Halberstaedter and Prowazek, and in no case have coccoid bodies comparable to the initial bodies of Lindner been observed either in or outside the cells. A large number of protoplasmic condensations and nuclear extrusions have been seen which at times have had a rather close similarity to inclusion bodies, but careful study has failed to reveal the characteristic granularity of true inclusions. Intracellular collections of bacteria, previously described as pseudo-inclusions, have also been observed. The majority of these have been made up of rod-shaped bacteria.

Various types of bacteria have been found, both in and on the epithelial cells and also free in the secretions. Small Gram-negative rods, morphologically identical with *Bacterium granulosus*, have been observed on numerous occasions. These were usually attached to living epithelial cells, but have been relatively few in number and have never been seen in turf-like arrangement as are *Hemophilus conjunctivitis* (*B. Koch-Weeks*) and the pneumococcus in acute conjunctivitis. The frequency with which small rods are encountered in culture from the monkey lesions makes it very difficult to say whether the bacteria seen have been *Bacterium granulosus* or not. Other bacterial types have been encountered in the smears. *C. xerosis* has been rather frequently observed on dead epithelial cells. In one smear taken from an incipient lesion rather large numbers of diplococci were found, usually unattached to the cells.

Follicular contents, obtained at various stages of the disease, and stained with Giemsa's stain, have been examined. Careful examination has dis-

closed only a very occasional bacterial form, in no instance resembling *Bacterium granulosis*. It would seem that the follicular contents are ordinarily bacteria-free.

The cytology has appeared to be very similar to that observed in human trachoma. The majority of the cells are large mononuclear (epithelioid or young endothelioid cells of different authors) and are the pale staining cells which make up the center of the follicles. Some appear to be undergoing degeneration, while occasionally a nucleus undergoing karyokinesis has been observed. The second most common cell observed is the small lymphocyte which makes up the periphery of the granulation. Other types of cells are in extreme minority. An occasional polymorphonuclear leucocyte is seen and a few epithelial cells. Plasma cells have been seen only rarely and Leber cells never.

Bacteriological findings

Of five animals studied culturally, *Bacterium granulosis* has been recovered from the lesions of four. The duration of the disease in these animals has varied from thirty to four hundred and fifty days. The technical difficulties concerned in the isolation have been extremely great due to the sometimes overwhelming preponderance of contaminating microorganisms, particularly moulds, which have rendered the use of leptospira medium impossible and which have frequently overgrown the plates so as to make them worthless. In no instance has *Bacterium granulosis* been recovered on the first attempt and in two cases it has been necessary to repeat the cultural examinations as many as six times.

The strains isolated appear to be identical in every way with those recovered from human cases and have in two instances produced typical infection in normal *M. rhesus* monkeys.

Some confusion has arisen because of the frequent presence on the monkey conjunctiva of other small Gram-negative motile rods which morphologically are similar or indistinguishable from

Bacterium granulosis but which differ in some essential biological characteristics. Similar bacteria are commonly encountered in cultures made from the human trachomatous conjunctiva. One type frequently seen both in the monkey and human disease appears to form a rather definite group and resembles closely the small pigment-producing rod described by Noguchi as occurring in association with *Bacterium granulosis*. Three different strains of this bacterium have been tested on the monkey conjunctiva without result.

A wide variety of other microorganisms has been recovered. Diphtheroids of various types have frequently been encountered and *C. xerosis* is found almost constantly. Other common bacterial forms, such as various cocci, sarcinae, and large Gram-positive and negative bacilli occur in abundance. None of these has been studied for exact identification.

Inoculation of *Macacus rhesus* with human trachomatous materials

Nicolle, Cuenod, and Blaizot¹⁷ and a number of other investigators have reported the immunity of the *Macacus rhesus* to infection with human trachomatous materials. Additional failures in four animals of this species were reported by Noguchi¹ with materials from the five Indian cases used for his culture experiments. On the other hand, definite success has resulted in attempts made recently at the Rockefeller Institute, where Olitsky, Knutti, and Tyler¹⁸ produced a definite granular conjunctivitis in nine monkeys after subconjunctival injection, and in four after simple swabbings of the conjunctiva with secretions. A further successful inoculation has been reported by Wilson¹⁶.

The experimental disease is described by Olitsky, Knutti, and Tyler as being identical with that induced by cultures of *Bacterium granulosis*. The reaction consisted of a slowly progressing granular conjunctivitis, occurring first in the inoculated conjunctiva and later spreading to the uninoculated eye. The outstanding features of the affection

were congestion, edema, and thickening of the conjunctiva which was studded with numerous follicles, covering the tarsal plates as well as the retrotarsal membrane. In the lower conjunctiva, similar but less marked changes occurred. The histopathological lesions were similar to those of human trachoma, consisting chiefly of numerous large typical lymphoid follicles, scattered monocytic infiltration, and thinning out or complete denudation of the epithelial layer. In addition there was sparse scar tissue formation, especially in the subepithelial tissue and in a narrow zone around some of the follicles.

Wilson¹⁶ has recently reported the inoculation of two *Macacus rhesus* monkeys with scrapings from human trachomatous individuals. The first inoculation proved negative in each case but a second attempt resulted in a follicular reaction which he describes as absolutely indistinguishable from the folliculosis which occurs spontaneously in these animals.

Five inoculations made by me have been negative. In two animals only one attempt was made but in the other three repeated subconjunctival injections of large quantities of trachomatous material removed in the course of expression operations resulted in only transient traumatic reactions. Repeated swabbings with secretions from a recent active case of trachoma were tried on one of the last three animals without result. It is interesting to note that these three animals showed no immunity to infection with tissue from monkeys previously infected by *Bacterium granulosis*, for granular lesions resulted from the first attempt. If we are to assume that the experimental disease produced by inoculation with *Bacterium granulosis* is actually trachoma, some very definite change in the virus must occur, since monkey tissue is far more highly infective for normal monkeys than human tissue.

Probable non-filterability of virus of experimental granular conjunctivitis

In a previous report⁸ I described filtration experiments which tended to

show that the virus of the experimental disease was held back by Mandler (regular type) filters. As only a small number of animals was used the experiments could not be considered conclusive. Similar results, have, however, been obtained by Olitsky and his associates¹⁹ from much more extensive experiments.

Normal conjunctiva of the *Macacus rhesus*

The death of several of our macaques which had not yet been inoculated furnished specimens for the histological study of the normal monkey conjunctiva.

The epithelium, like that in man, is composed of a varying number of layers according to the part of the conjunctiva examined. In the bulbar conjunctiva near the limbus the epithelium may be quite thickened and as many as sixteen layers of cells may be counted. As the cul-de-sacs are approached the number diminishes to six or eight. Many of the epithelial cells of the bulbar portions contain pigment granules, especially in the cells which lie next to the basal layer. In the cul-de-sacs the epithelium has only three or four layers and over the tarsi there are only two or three. Here the epithelium is composed of a basal layer of oval cells with deeply staining nuclei parallel to the surface, and one or two layers of superficial cylindroidal cells with nuclei less deeply staining which lie perpendicular to the surface. Scattered throughout, but in greater numbers in the cul-de-sacs, lie calciform cells. In one of the specimens examined there was a surprising number of these present. When present in folds of the conjunctiva they produced a distinct glandular appearance, comparable to the pseudo-glands of Ivanoff in the human conjunctiva.

The deep layer or chorion of the conjunctiva is made up of loose connective tissue formed of anastomosing fibrils. The fixed tissue cells have small, deeply staining nuclei, many of which are elongated. There is a striking absence of the lymphocytic infiltration which is so commonly seen in the hu-

man conjunctiva and which has been termed the adenoid layer. Scattered in and among the fixed tissue cells are, however, wandering cells of various types. None of the sections examined showed any suggestion of a grouping of lymphocytes into follicles though in certain cases this must occur. There is

one other difference is that the adenoid layer is virtually absent in the monkey, a feature which has been considered by some to account for the failures to reproduce characteristic trachoma in this animal. The presence of the cartilaginous plate may be considered to have no particular significance.

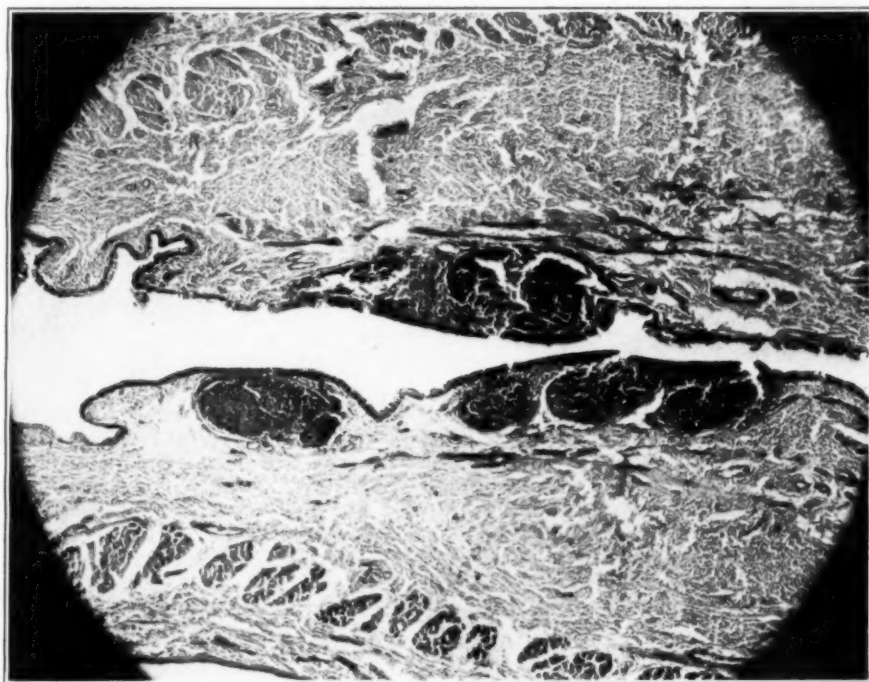


Fig. 6 (Thygeson). Confluent follicles in upper cul-de-sac.

commonly, however, a slight tendency to lymphoid infiltration at the upper border of the superior tarsus.

Large acino-tubular glands corresponding to Krause's glands in the human eye are present in both upper and lower fornices. In the lower fornix a small cartilaginous plate, in close proximity to Krause's glands and imbedded in dense connective tissue, has been seen frequently.

In general the monkey conjunctiva and lids bear a close resemblance to those of man, but there are several rather distinct differences. In the monkey the vascular network of the conjunctiva appears to be less strikingly developed than it is in man. The prin-

Pathological findings

The conjunctivæ of ten animals showing lesions have been examined microscopically. Of these, two showed clinically a very severe disease with marked tarsal involvement, six showed moderate lesions with mild tarsal involvement, while two showed only a cul-de-sac localization.

The severe disease is characterized by a diffuse subepithelial infiltration involving the entire conjunctiva (Fig. 6) but least marked in the bulbar portion. Associated with this are numerous lymphoid follicles, sometimes discrete but occasionally confluent, which are most marked in the cul-de-sacs. Maximum thickening of the conjunctiva oc-

curs at the upper border of the superior tarsus (Fig. 7).

The infiltration is made up largely of small lymphocytes and plasma cells, though other types, such as epithelioid cells and polymorphonuclear leucocytes, are occasionally seen. In some of the cases the tarsal infiltrate appears to consist predominantly of plasma cells

cytes with an occasional plasma cell interspersed. The inner zone is made up of large mononuclear cells of the epithelioid type. A few cells in karyokinesis have been seen but no Leber cells. In young follicles the supporting stroma is poorly developed but in older follicles it becomes more marked and a few fibroblasts may be seen towards



Fig. 7 (Thygeson). Infiltration of upper border of tarsus.

while in others small lymphocytes are in the majority. The disease tends to remain quite superficial although there is some rather deep involvement of the angles and upper border of the tarsus where new vessel formation is very conspicuous. Perivasculitis of the deeper vessels has not been observed. The upper limbus in all cases examined has shown no evidence of pannus.

The follicles vary in size but the majority reach dimensions up to 500 μ . The typical follicle (Fig. 8) is divided into two zones, a peripheral zone of small cells with deeply staining nuclei, and a central zone of large cells with nuclei taking a much lighter stain. The outer zone is made up of small lympho-

the periphery. No typical fibrous capsule has been observed. As a matter of fact the follicle differs in no essential respect from that seen in early trachoma, in follicular conjunctivitis, or in spontaneous folliculosis, and cannot be differentiated from the ordinary follicle seen in lymph glands.

The epithelium does not show extensive changes. Over the follicles it may be denuded (Fig. 8) but whether or not this has occurred during fixation or sectioning cannot be determined. The epithelium itself appears to have little infiltration. A few sections show some lymphocytic infiltration but nothing comparable to that so commonly seen in human trachoma. There is no in-

crease in the number of layers. What appears to be a definite increase in the mucoid activity of the epithelium is substantiated by the presence of large numbers of goblet cells. However, large numbers of these are also found in the normal conjunctiva as has already been described. Papillary appearance is not marked though there are frequently

of the tarsi. Lymphocytes appear to predominate in the infiltration but certain cases have shown large numbers of plasma cells. However, in comparing the two diseases it must be remembered that the monkey lesions are young and it is possible that if the disease persisted for years more comparable lesions might develop.

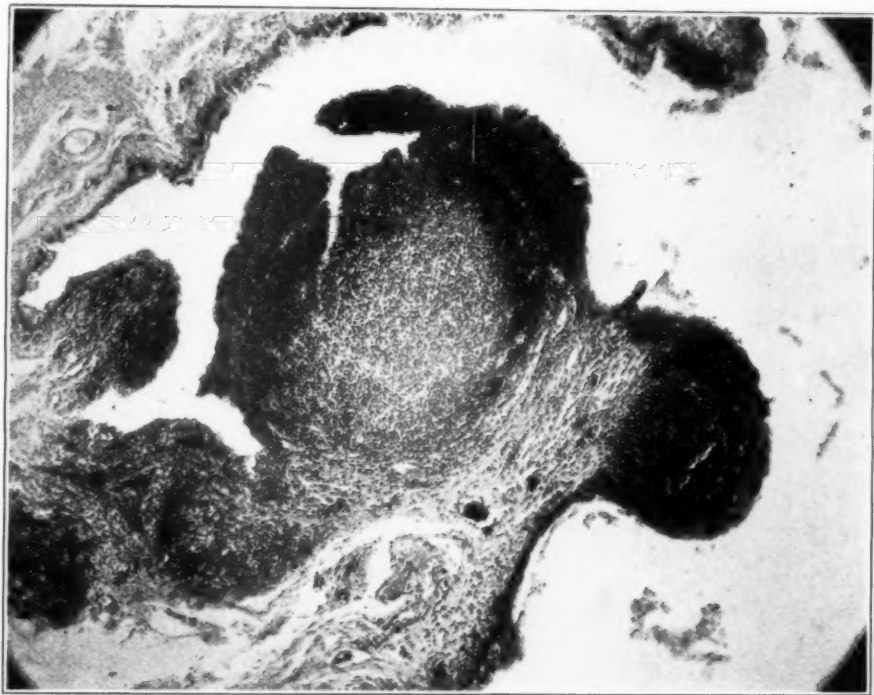


Fig. 8 (Thygeson). Large necrotic follicle in upper cul-de-sac.

epithelial downgrowths or crypts. No true epithelial cysts have been found.

Fibroblastic reaction is not marked although the presence of well defined scars has been noted. Scarring has appeared much more prominent clinically than in the microscopic sections. In three animals scarring sufficient to cause bowing of the tarsus has occurred as illustrated in Figure 9.

The monkey disease thus appears to differ from human trachoma in several important respects. Most important is the entire absence of all corneal changes. Degenerative changes are minimal. Cicatricial changes do unquestionably occur but produce no other deformity than slight incurvation

Experimental trachoma

A complete review of the literature on this subject may be found in Noguchi's monograph¹. Additional reviews have been compiled by V. Morax and P. J. Petit in *Le Trachôme* and by A. Cuenod and R. Nataf in a book of the same title.

Most investigators agree that the chimpanzee is the animal most susceptible to trachomatous infection with the Algerian magot ranking second. Lesions have been produced in other monkeys with difficulty. The lesions in the chimpanzee as described by Cuenod and Nataf are characterized by an incubation period of about twelve days and by an absence of all outward in-

flammatory signs. There is no secretion, swelling, or inflammation, and it is only on eversion of the lid that signs of the disease can be seen. At the end of the first month the experimental disease appears comparable to Trachoma IIa of the human eye. The granulations have invaded the tarsus, are soft, and burst under pressure. The products of expression reveal the same cytologic

nuclears. The follicles, located in the adenoid layer, push the epithelial layer upward producing a distinct elevation. The epithelium itself may be infiltrated with lymphocytes and other cells.

Summary and conclusions

1. Recent cultures of *Bacterium granulosis* obtained from cases of human trachoma have induced a granular

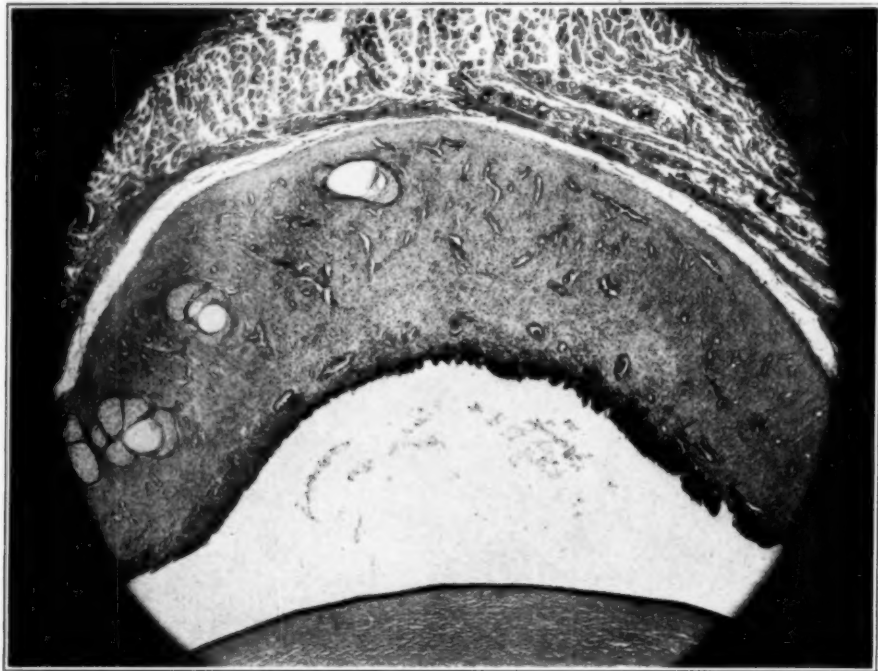


Fig. 9 (Thygeson). Cicatricial distortion of tarsus.

elements as the follicular pulp in man, including epithelial cells with Pro-wazek-Halberstaedter inclusions, large mononuclears, Leber cells, and so on. After several months the disease usually undergoes retrogression, but fine cicatricial tracts in the healing areas have been observed. No corneal involvement has been described.

Histologic sections have shown the disease to be very similar to trachoma in man: there is thickening of the epithelium, sub-epithelial infiltration with lymphocytes, perivascularitis, follicles sharply delimited with dark staining periphery formed of lymphocytes, and paler centers made up of large mono-

conjunctivitis in *Macacus rhesus* monkeys having a close similarity to the early stages of trachoma but differing later in the absence of advanced cicatricial and degenerative changes and in the absence of pannus. The experimental disease is highly infectious for normal monkeys which can be readily infected by transfer of tissue or secretions. The incubation period runs generally from seven to 21 days.

2. Only recently isolated strains of *Bacterium granulosis* appear infective, and first implantation of the culture on the conjunctiva is accomplished with difficulty. When once this is obtained the disease may be readily trans-

mitted to other animals, suggesting a definite adaptation of the virus to the monkey conjunctiva.

3. Bacterium granulosis has been recovered, though often with difficulty, from various stages of the experimental disease. As it has been recovered from four out of five cases studied it may be assumed to be constantly present.

4. Mild spontaneous folliculosis has been observed in three animals on delivery. Isolation of these animals under suitable hygienic conditions resulted in a prompt return of the conjunctiva to normal. The spontaneous disease as observed in these animals appeared to be very definitely distinguishable from the disease induced by Bacterium granulosis. It is realized, however, that a much more severe spontaneous disease does occur, particularly in other species of monkeys.

5. The *Macacus rhesus* appears to be remarkably resistant to infection with human trachomatous materials as failure resulted from each of five attempts made by me.

6. No agglutinins for Bacterium granulosis could be demonstrated in the blood sera of monkeys infected with this organism even though extensive conjunctival disease was present. All attempts to vaccinate locally by subconjunctival injections of killed cultures failed.

7. A large number of epithelial smears made from the experimental disease have failed to show the presence of inclusions of Prowazek and Halberstaedter. Various types of bacteria have been seen in and on the epithelial cells and free in the secretions but none has been present in sufficient numbers to indicate an etiologic significance. The cytology of the follicular content appears to be similar to or identical with that of human trachoma.

8. The normal conjunctiva of the

Macacus rhesus differs from the normal human conjunctiva in the virtual absence of the adenoid layer.

9. Microscopic sections of the experimentally infected conjunctiva show the essential lesion to consist of a subepithelial infiltration with lymphocytes and plasma cells associated with lymphoid follicles of the ordinary type. The thickening of the conjunctiva is most marked at the upper border of the superior tarsus and is least marked in the bulbar and tarsal portions. Bulbar follicles are found but the limbus and cornea show no changes. Mild cicatricial changes are observed involving the fornices and occasionally the upper and lateral borders of the tarsus. In a few instances this has been sufficient to cause mild tarsal bowing. All sections show a complete absence of the degenerative changes which are so common in human trachoma. The experimental disease appears to differ from spontaneous folliculosis only in severity, in greater involvement of the tarsus, and in the presence of cicatricial changes.

10. The virus of experimental granular conjunctivitis is held back by medium grade Mandler filters.

11. The present studies confirm a previously expressed belief that the question of the etiologic relationship of Bacterium granulosis to trachoma can never be settled by monkey experiments. Trachomatous infection of the monkey conjunctiva cannot be diagnosed with certainty, as insufficient differences exist between the disease induced by inoculation with trachomatous materials and the disease occurring spontaneously. Further human inoculations, preferably in blind eyes, must be made and these should be performed with fresh cultures, the virulence of which can be determined by control inoculation in monkeys.

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References

- ¹ Noguchi, H. Jour. Exper. Med., 1928, v. 48, suppl. 2.
- ² Tilden, E. B., and Tyler, J. R. Jour. Exper. Med., 1930, v. 52, p. 617.
- ³ Finnoff, W. C., and Thygeson, P. Amer. Jour. Ophth., 1929, v. 12, p. 651. Arch. of Ophth., 1931, v. 5, p. 527.
- ⁴ Olitsky, P. K., and Tyler, J. R. Science, 1930, v. 71, p. 263.

- ⁶ Olitsky, P. K., Knutti, R. E., and Tyler, J. R. *Jour. Exper. Med.*, 1931, v. 53, p. 753.
⁷ Olitsky, P. K., *Trans. Amer. Acad. Ophth. and Oto-Laryngol.*, 1930, p. 226.
⁸ Weiss, C. *Trans. Amer. Acad. Ophth. and Oto-Laryngol.*, 1930, p. 234.
⁹ Thygeson, P. *Revue Internat. Trachôme* (in press).
¹⁰ Tyler, J. R. *Science*, 1929, v. 70, p. 612.
¹¹ Hess, C., and Romer, P. *Arch. f. Augenh.*, 1906, v. 55, p. 1.
¹² Wilson, R. P. *Third Annual Report Giza Memorial Ophthalmic Laboratory, Cairo*, 1929.
¹³ Nicolle, C., and Lumbroso, U. *Arch. d. Inst. Pasteur, Tunis*, 1926, v. 15, p. 240.
¹⁴ Olitsky, P. K., *Revue Internat. du Trachome*, 1930, v. 7, p. 173.
¹⁵ Weiss, C. Personal communication.
¹⁶ Olitsky, P. K. *Trans. Amer. Acad. Ophth. and Oto-Laryngol.*, 1930, p. 225.
¹⁷ Wilson, R. P. *Brit. Jour. Ophth.*, 1931, v. 15, p. 433.
¹⁸ Cuenod, A., and Nataf, R. *Le Trachôme*, Masson et Cie, Paris, 1930.
¹⁹ Olitsky, P. K., Knutti, R. E., and Tyler, J. R. *Jour. Exper. Med.*, 1931, v. 54, p. 31.
²⁰ Olitsky, P. K., *Jour. Exper. Med.*, 1931, v. 54, p. 557.

ALBINISM IN THE PROGENY OF NEGRO AND WHITE PARENTS

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The case history and record of examination of an eight year old albino idiot is presented. Consanguinity is a suspected factor in albinism but lacks scientific proof. Complete albinism can only be established by histologic study. Much is yet to be learned about the subject. From the Department of Ophthalmology, Creighton Medical College, Omaha, Nebraska. Read before the American Ophthalmological Society, June 4, 1931.

In their monograph on "Albinism in Man," Pearson, Nettleship and Usher¹ call attention to the paucity of reports on this subject as far as America is concerned. A survey of the history of albinism shows that this is true, particularly in regard to its relation to ophthalmology. In 1909 a case report was presented before this Society by Libby² in which only a few features of typical albinism were emphasized. In discussing his paper, Theobald³ stated that albinism in the negro was exceptionally rare. As comparatively few detailed accounts of albinism are to be found in the records of American ophthalmology, a very brief summary of the subject as a whole may prove helpful in the discussion of the specific findings of the following report.

Saint-Hilaire⁴ in 1832 made the first general classification of albinism, designating the types as perfect, partial, imperfect. He himself recognized the rather broad limitations of this classification, since even in the more pronounced cases he was not quite sure of the total absence of pigment. Furthermore, he also observed that the appearance of the eyes was not identical in

all cases of a given class. Later attempts at classifying albinism according to the degree of ocular pigmentation have been equally unsatisfactory. Usher⁵ insists that a mere ophthalmoscopic examination is in itself not sufficient to give evidence as to the completeness of the albinism; adding by way of confirmation that there may be some pigment in the iris, choroid or retina even when such elements of typical albinism as red pupils, characteristic iris, nystagmus, and photophobia are present.

Through the courtesy and cooperation of Doctors Thomas Lacy and H. B. Dye of the Institution for Feeble Minded Children at Glenwood, Iowa, the following case was selected for observation and study.

Case report

History. Andrew S., aged 8¼ years, height 45 inches, weight 44 pounds, middle grade idiot of the mental age of two years presented all the essential characteristics of albinism. His father, who was white, married a negress. Their first child was a girl who was black. Through incest between the

father and his half-breed daughter, when she was fifteen years old, this idiot albino resulted. Some details of the family history are in doubt but the above statements were made by a Juvenile Court officer of Des Moines, Iowa, in the report of his investigation and are accepted by the writer as the official record.

In spite of the fact that the state of Iowa has offered a reward for the apprehension of this white criminal on a charge of rape of his own daughter, the albino child's maternal grandmother maintains that the fugitive "white man" is also an albino negro and that he was legally married to the child's mother. Further details of the family history have been equally questionable except that Andrew's maternal uncle Elmer, is also an inmate of the Institution at Glenwood. This boy is black, an epileptic, a second degree imbecile. A somewhat striking feature in this case is a small unpigmented area on the right arm.

Aside from the albinism, mental deficiency and under development, Andrew's general examination was negative. The laboratory studies include urinalysis, blood count, serum Wassermann, and x-ray of the skull. His facial features, shape of head and kinky hair are quite typically negroid, except for the lack of pigment.

Eye examination. That some vision was present in each eye was determined by the fact that he followed and fixed upon a light at one half meter. The eyebrows and lashes were white and downy. His lids were squinted even in reduced illumination. There was an alternating, divergent strabismus of approximately fifteen degrees. The irides were light gray blue. The pupils were red and reacted sluggishly to light. There was a horizontal nystagmus which was exaggerated on extreme rotation. There were wavy, sheet-like opacities in the vitreous which are more accurately described as semi-translucent than completely opaque. The discs were almost dead white and could not be differentiated from the scleras by their color. The

choroidal vessels were visible throughout the eyeground and could be readily distinguished from the retinal vessels. As elsewhere, the macular region appeared completely devoid of pigment. Both eyes were almost identical in all details, each having approximately eight diopters of myopia. When trans-



Fig. 1 (Swab). Albino in dull daylight. Note negroid and albinotic characteristics.

illuminated by contact with the bulbar conjunctiva or even with the lids, the luminosity was almost as great through the iris stroma as through the pupil itself.

Comment

Manz⁶, who made the first microscopic study of the eye of a human albino, found a small quantity of pigment in the iris epithelium where none had been detected in the clinical examination. He believed, however, that the thickening of the iris might be the reason for the apparent change in the

macroscopic appearance in some cases, even to the point of indicating pigment where none actually existed. Pearson, Nettleship, and Usher¹ concluded that only by histologic studies could ocular pigment be detected or found wanting in the more pronounced cases. To avoid further confusion it seems desirable to reserve the term "complete" or "per-



Fig. 2 (Swab). Albino with maternal uncle who is black except for patch of leukoderma on right arm. Flashlight with rapid camera. (Note artist's attempt to remove spot of leukoderma.)

fect" for those cases of albinism which have been proved histologically.

The geographical distribution of albinism indicates its existence in all latitudes and climes. It has been reported in ratios varying from 1 in 5,000 to 1 in 30,000 of the population. Many cases have been reported in Norway, Scotland, Argentine, Philippine Islands, Sicily, Belgian Congo, and other parts of Africa. There is a common belief that albinism occurs more frequently in the tropics than elsewhere. This opinion was fostered by early reports of races, tribes and nations of albinos that had been seen in Africa, but for these legends there is no supporting evidence.

Of the more recent surveys which should be consulted for statistics are those by Magnus⁷ in Norway, and

Heiser and Villafranca⁸ in the Philippine Islands. Without fear of contradiction it may be stated that pigmentation surveys have fallen short in the study of the problem. As it is not always possible to have the reported case observed by trained examiners, especially by ophthalmologists, there is but little scientific value in our present statistics.

Among the etiologic possibilities in albinism, consanguinity of the parents has been frequently advanced although seldom is this fact established beyond question. Stelwagon⁹ is convinced that the rare occurrence of albinism speaks against the causation as due to intermarriage of blood relatives. On account of the stigma which is connected with marriages even between cousins, it is not difficult to understand the tendency to conceal evidence pertaining thereto. The anthropologist has been handicapped by the relative infrequency of the condition as well as by the questionable historical data that are obtainable. The genetics of albinism have been studied extensively by horticulturists and zoologists in an attempt to classify the condition in accordance with Mendel's principles of heredity. Some have gone so far as to state that it is a recessive Mendelian characteristic but this claim is not supported by sufficient evidence to prove anything conclusive in the case of the human albino.

The poor visual acuity of albinos is not explained by their errors of refraction which Lagleyze's¹⁰ statistics indicate to be equally divided between hyperopia and myopia with an approximate average of four and one-half diopters of astigmatism. Believing that the vision in such cases was reduced by retinal dazzling, Komoto¹¹ injected Indian ink subconjunctivally. In one case he reported improvement in vision from ability to count fingers at five feet, to 6/15. This method is favorably commented upon by Galtier¹² who also advocates a procedure which Komoto had used but abandoned; namely, tattooing three or four millimeters of the corneal periphery. These methods do not appear to possess any particular

advantages over the use of a pinhole screen as was suggested by Picqué¹³ in 1886. The writer has considered for some time a method which combines all of the therapeutic advantages of the subconjunctival injection of an opaque substance, the limbus tattooing and the pinhole screen. The method referred to is the application of a contact lens, specially constructed of opaque glass except for a clear pupillary opening of two millimeters diameter. The scleral flange or collar should be large enough to cover a considerable portion of the sclera. Such a contact glass has never been fitted for one of these cases, although the manufacturers have recently expressed a willingness to make some for trial. The most plausible objections on practical grounds are the difficulty of the patient's applying the large contact glass himself and the danger of producing a corneal abrasion through the uncontrollable nystagmus.

That the resolving power of the retina of an albino can be educated is illustrated by the following cases. Mr. F., with only 6/60 vision, has had three years of college work and supports himself by employment as a clerk in a railroad company's office. Mr. J., whose visual acuity is also 6/60, is employed as a laborer in a packing house. He left school early in life and has never done any close routine work. Neither of

these patients shows any appreciable benefit to distance vision from wearing glasses, but at about twelve centimeters, the acuity is materially improved. The clerk is able to read type two on the Wells card with his left eye and type three with his right, in each instance with relative ease. The laborer cannot read better than type four with either eye and this, after an effort which occasions great discomfort. As these patients have somewhat similar errors of refraction and are albinos of corresponding grade, it seems possible to account for their visual efficiency only on the grounds of education and training of the visual elements in the retina and brain.

Adler¹⁴ is of opinion that the poor vision of albinos is best explained by the absence of an absorbing pigment layer. Both Nettleship¹⁵ and Graves¹⁶ reported instances of albinos who developed pigment after early childhood but they do not mention improved visual acuity to correspond with the acquisition of pigmentation.

Since the complete rôle of organic pigment is so little known and congenital degenerations so little understood, the subject of albinism in man must remain for the present at least, a matter of speculation and a subject for further research.

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References

- ¹ Pearson, Nettleship, and Usher. *Drapers' Company Research Memoirs*, 1911 and 1913, Dulau and Co., Ltd., London.
- ² Libby. *Trans. Amer. Ophth. Soc.*, 1909, v. 12, p. 246.
- ³ Theobald. *Discussion*, *Trans. Amer. Ophth. Soc.*, 1909, v. 12, p. 246.
- ⁴ Saint-Hilaire. *Histoire générale et particulière des anomalies de l'organisation chez l'homme et les animaux*. 1832-6, v. 1, p. 293.
- ⁵ Usher. Quoted by Pearson, Nettleship, and Usher, *Drapers' Company Research Memoirs*, 1911 and 1913, Dulau and Co., Ltd., London.
- ⁶ Manz. *Arch. f. Ophth.*, 1878, v. 24, pp. 4 and 139.
- ⁷ Magnus. *Abst. Jour. Amer. Med. Assoc.*, 1922, v. 79, p. 780.
- ⁸ Heiser and Villafranca. *Phillipine Jour. Sc.*, 1913, v. 8, p. 493.
- ⁹ Stelwagon. *Diseases of skin*, 7th edition, 1914, W. B. Saunders Co., Philadelphia.
- ¹⁰ Lagleyze. *Ophth. Year Book*, 1908, p. 155.
- ¹¹ Komoto. *Klin. Monats. f. Augenh.*, 1907, v. 45, p. 534.
- ¹² Galtier. *Ann. d'Ocul.*, 1908, p. 125.
- ¹³ Picqué *Thèse Fac. Méd.*, Paris, 1886, p. 160.
- ¹⁴ Adler. *Arch. of Ophth.*, 1928, v. 57, p. 346.
- ¹⁵ Nettleship. Quoted by Pearson, Nettleship, and Usher, *Drapers' Company Research Memoirs*, 1911 and 1913, Dulau and Co., Ltd., London.
- ¹⁶ Graves. See Prichard, *The natural history of man*, 2nd. edition, 1845, p. 79 et seq.

DIFFUSE PAPILLOMA OF THE LIMBUS

MORIE FREDERICK WEYMANN, M.D.
LOS ANGELES

The Shahan thermophore is the ideal instrument for removal of papillomata at the limbus. Several cases successfully treated are here reported. Read before the Los Angeles Society of Ophthalmology and Otolaryngology, November 9th, 1931. From the department of ophthalmology, University of Southern California Medical School.

The corneal limbus is a transition zone from the cylindrical and cuboidal epithelium of the conjunctiva to the stratified squamous epithelium of the

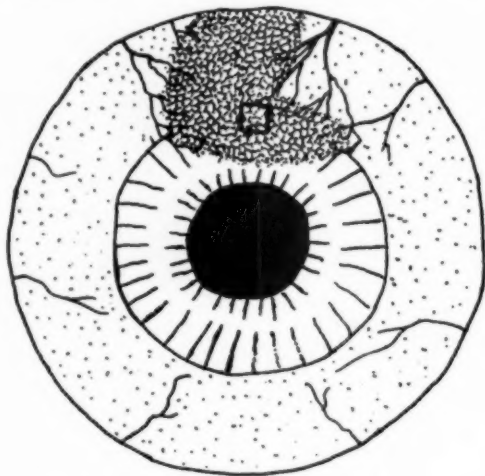


Fig. 1 (Weymann). Sketch showing location and extent of neoplasm.

cornea, and is therefore, a site of election for epithelial new-growths. If non-malignant, these tumors are designated as papillomata, and if malignant, carcinomata. The following case will illustrate a typical example of diffuse papilloma of the limbus.

E. W. C., aged 78 years, was referred to me by Dr. Sherman Clark on April 27, 1931. He had consulted Dr. Clark for failing vision and during the examination a growth was discovered at the upper left limbus. There had been no pain. Aside from this growth the eyes showed no other pathological changes except moderate senile opacification of the lenses. The patient was of the opinion that the growth had been present for two years.

The neoplasm was a flat, L-shaped, rose-colored, granular appearing mass about 7 mm. in diameter, and extended

onto the cornea for 2 to 3 mm. The involved conjunctiva was freely movable over the underlying sclera. A marked increased vascularity of the regional conjunctiva was present with some irritation due to the rough surface of the growth. Figure 1 is a diagrammatic sketch, which shows the location and extent of the neoplasm. Under the biomicroscope the tumor was seen to consist of lobules, through the center of each of which passed a tortuous vessel perpendicular to the surface of the globe. This is shown schematically in figure 2, which represents the area of the square outlined in figure 1. Connective tissue septa seemed to separate the individual lobules. The deeper layers of the cornea appeared uninvolved.

In order to secure sections of the tumor Dr. Clark removed the conjunctival portion up to the limbus by dissection. After the wound had healed, the Shahan thermophore at 150° F. was applied to the corneal portion for one minute. Three such adjoining applications

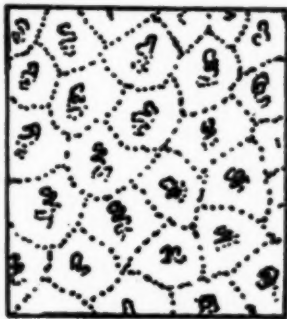


Fig. 2 (Weymann). Area from square shown in Fig. 1.

were necessary to cover the entire growth, but all the applications were made at one sitting. The epithelium immediately came away as a thin waxy pellicle. The patient was later observed

by Dr. Clark, who reported that the area healed, leaving no trace of the tumor. On November 9, 1931, the patient was seen by me and there was no sign of recurrence.

I have observed two cases of such tumors where the clinical picture was different in that the plaque at the limbus resembled a spot of candle grease, and could be wiped away, only to return. This greasy appearance is caused by a desquamation of the upper layers of the stratified cells which become cornified. Both of these greasy tumors were small, one being seen and treated by me eight years ago with the Shahan thermophore. It was cured by the one application. The other similar growth was seen in consultation with Dr. A. Ray Irvine. He eradicated this papilloma also by one application of the thermophore.

A microscopic section of the conjunctival portion of the tumor in the case of E. W. C. was examined and described by Dr. E. Butt as follows: The structure presents a uniformly thickened layer of squamous epithelial cells superimposing a layer of vascular fibrous tissue. The epithelial cells have a disorderly arrangement within the layer, in places forming large whorls, but having no tendency to the formation of

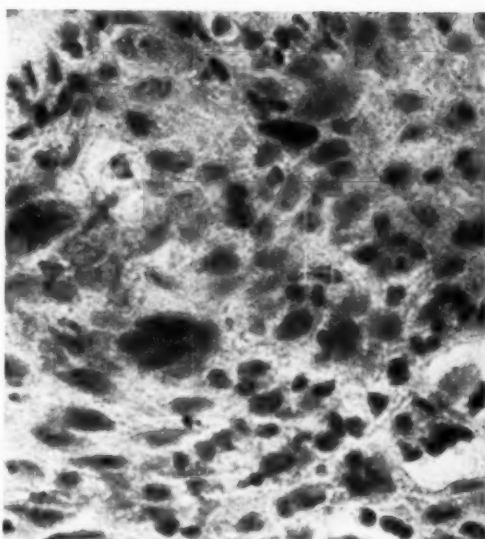


Fig. 4 (Weymann). High power view showing the malignant appearance of the cells and tendency toward whorl formation.

keratin. Some of the cells are large, others are small, and in places are separated by edema. In many of the cells a hydropic degeneration is seen. The nuclei are of varying sizes and shapes, some very large and pale, others small and pyknotic. An occasional mitotic figure is seen. Between the cells there are a few polymorphonuclear leucocytes and round cells. In the fibrous tissue stroma the blood vessels are widely dilated and filled with blood, throughout there is a heavy round and plasma cell infiltration. In some of the sections the atypical epithelium tapers off into more nearly normal epithelium. Notwithstanding the atypical appearance of the cells no apparent invasion of the fibrous stroma by cells or groups of cells is seen. In fact, the proliferative changes are confined to the uniformly thickened epithelium. Except for minor and quantitative changes, the picture is not unlike that of Bowen's precancerous dermatosis. The diagnosis is papilloma of the conjunctiva. Figure 3 is a low power microphotograph of the conjunctival portion of the papilloma, the epithelial portion of which is folded on itself. Figure 4 shows a high power magnification, which gives a good idea

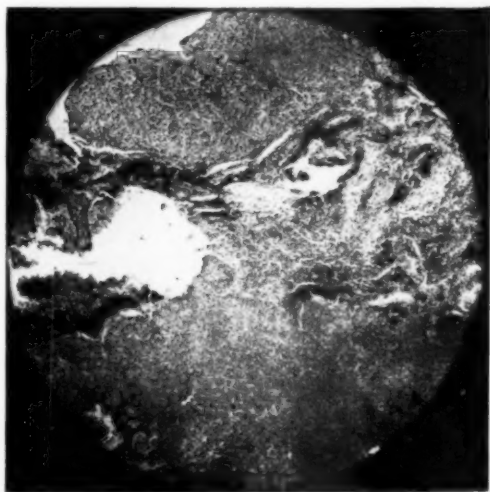


Fig. 3 (Weymann). Low power microphotograph of the conjunctival portion of the papilloma.

of the malignant appearance of the cells and the tendency toward whorl formation.

It will be seen from this description that the only point which differentiates this growth from a malignancy is the fact that the basement membrane has not been broken and that there has been no invasion by tumor cells. Terrien and Cousin¹ have recently emphasized the close relationship of non-malignant and malignant epitheliomata of the limbus with the advice that all cases should be kept under observation over a considerable period, as papillomata may later develop into carcinomata. In fact, many times a papilloma may be a transition stage of a growth to malignancy.

One other case seen by me in 1926 more closely approached the malignant type on account of its tendency toward recurrence. When first seen, the lower half of the cornea and bulbar conjunctiva was involved, so that an extensive thermophore application was necessary. The growth disappeared leaving a clear cornea, showing that Bowman's membrane had not been penetrated. Nine months later there was recurrence of almost the entire tumor. This was again removed by the thermophore and remained clear for two years, at which time only a small nodule reappeared. Unfortunately, due to some other trouble, the patient committed suicide before he returned for treatment. One is thus unable to state whether the growth might have ultimately become malignant or not. There was never any ulceration, which is usually a clinical manifestation of malignancy.

Contino² assembled all cases of papillomata reported previous to 1911 and

divided them into two groups, in the first of which were diffuse papillomata with the epithelial elements predominating, such as those which have been described. The other type has a predominance of fibrous tissue and takes the form of a mulberry-like prominence at the limbus. It also tends to be bound down to the scleral and episcleral tissue. This classification is purely morphological.

If one notes the results reported on removal of papillomata, which is usually done by dissection or the cautery, one is struck by the emphasis laid on the tendency toward recurrence. Terrien and Cousin¹ believe that removal with the high frequency current is the method of choice. I think, however, that in the thermophore of Shahan we have a technique which is superior to any for the removal of epithelial tumors at the limbus. No damage is done to normal tissue, and if there is recurrence, the procedure may be used repeatedly. In the event that these tumors become malignant, there is no tendency toward metastasis until the orbit is invaded, so that even where invasion of the cornea has begun, one should attempt to eradicate the tumor with the thermophore. If this is unsuccessful and invasion of the globe occurs, exenteration of the orbit seems to be the operation of choice. I wish particularly to stress the facts that papillomata of the limbus are potentially malignant tumors, that they may be successfully removed with the thermophore of Shahan, and that patients who have had such growths removed should be kept under observation periodically for several years because of the frequency of recurrence of these growths.

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References

- ¹ Terrien, F. and Cousin, G. *Arch. d' Opht.*, 1931, Sept., v. 48, p. 622.
- ² Contino, A. *Neue Beobachtungen und Untersuchungen über die Papillome des Limbus und der Hornhaut. Arch. f. Augenh.*, 1911, v. 68, p. 366.

THE BROWN DUOCHROME REFRACTION TEST

A description and comparison

MILTON JACOBS, M.D.

CHICAGO

A description of the Brown duochrome test is given with an exposition of the principles underlying it and of its advantages. A study of the refraction of 146 eyes was made with this apparatus and with the Snellen chart under white light. The tests were carefully controlled and a comparison of results made. Read before the Chicago Ophthalmological Society, October 19, 1931.

The principle involved in this method of refraction is based on the chromatic aberration of the eye.

The original spectrum of Newton has been greatly enlarged at both ends by the work of later investigators, and we now have knowledge of a series of radiations differing essentially only in wave length, but having the most varied properties conceivable. At one end are the gamma ray waves, or short x-ray waves which have the shortest known wavelength, and at the other end the electromagnetic, or wireless waves which have the longest known wavelength.

It is convenient to express the length of a wave in Angstrom units, (A.U.). An Angstrom unit is equivalent to one-one hundred millionth (0.000,000,01) of a centimeter. Using this system of measurement, the shortest gamma wave is about 0.005 A.U. or 0.000,000,000,05 cm. in length, and the longest wireless wave is hundreds of kilometers long—certainly a very wide range and one in which the visible spectrum occupies only a small part, as represented in table I.

provides are polychromatic; in other words, they are composed of a mixture of rays belonging to distinct colors of the visible spectrum—sunlight is the most complex of these. A monochromatic light is one which is composed of rays belonging to one and the same color of the visible spectrum.

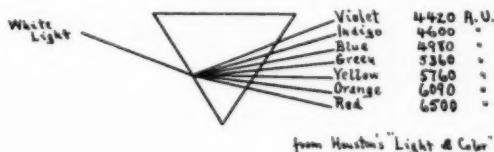


Fig. 1 (Jacobs). Dispersion of white light by prism.

When passed through a prism, white light is broken up into its component monochromatic constituents or spectral colors. The prism bends the various rays of light out of their path to a different extent as shown in diagram. Because of the exceedingly gradual blending of the hues, it is impossible to assign any definite width to the different colored regions of the spectrum. The wavelengths given in figure 1

Table I

Gamma rays 0.005 to 5 A.U.	X-rays Unexplored region	Ultraviolet about 200 A.U. to 3900 A.U.	Visible spectrum 3900 to 7700 A.U.	Infrared to 1,070,000 A.U.	Unexplored	Electro-magnetic (wireless) Kilometers
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In this investigation we are concerned only with the visible portion of the spectrum, and further use of the term wave length will refer to the visible spectrum.

The lights and objects that nature

simply indicate the position and distribution of the colors in the spectrum.

The violet rays are bent most and the red least. Violet rays have the shortest wavelength and red the longest; the amount of dispersion by the

prism increases progressively as the wavelengths become shorter. The same is true of a convex lens which may be regarded as made up of an infinite number of prisms. When a beam of white light is incident on a convex lens,

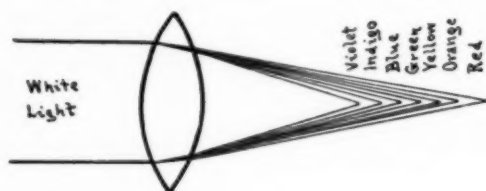


Fig. 2 (Jacobs). Refraction of white light by double convex lens.

each of its component colors converges to a different extent and comes to a focus at a different point—violet converging most and red least, as shown in figure 2.

Investigation into the behavior of the eye in focusing light was carried out by Wallaston, Young, Fraunhofer, and von Helmholtz. They demonstrated that the human eye was unable to focus clearly the various monochromatic lights placed at the same distance from it. They found that there was a difference in focus of from one to

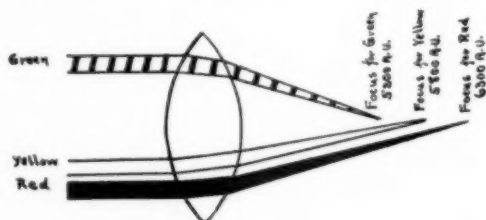


Fig. 3 (Jacobs). Chromatic aberration of white light by double convex lens.

three diopters between the extremes of the visible spectrum. We have at our command a simple means of overcoming chromatic aberration in optical instruments, by which achromatic lenses are produced. The eye however, acts like an uncorrected lens, and it is this chromatic aberration of the eye which makes possible the operation of the duochrome test for refraction.

The two colors used in the Brown Duochrome Refraction Test are green

and red, the former being about 5300 Angstrom units or 0.000,053 cm., and the latter about 6300 A.U. or 0.000,063 cm. in wavelength. Figure 3 shows how these two colors focus as compared

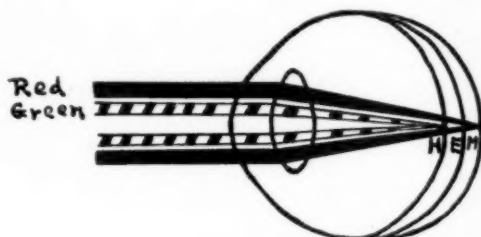


Fig. 4 (Jacobs). Focal points of red and green light in emmetropic, hyperopic, and myopic eyes.

with yellow light, which is the predominating factor in white light.

In an emmetropic eye which focuses white light on the retina, green light is focused in front of the retina, and red light behind the retina. The green and

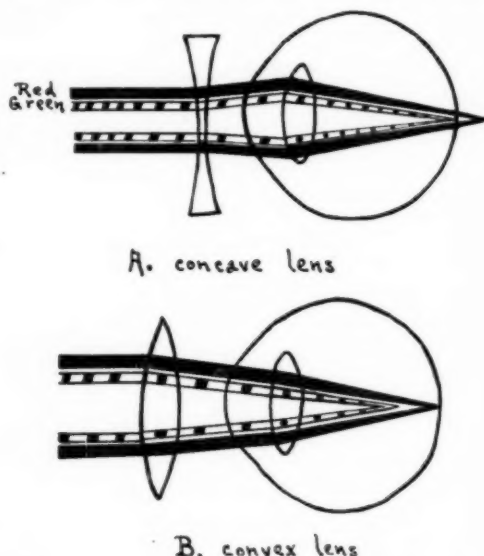


Fig. 5 (Jacobs). Effect of concave and convex lenses in focusing red and green light in the eye.

red light chosen in the test are of the same intensity, and have their mean wavelengths about equally spaced from the central sodium line which has a wavelength of about 5800 A.U. This makes possible the focusing of the

green light at about the same distance in front of the retina as the red light is focused behind the retina as represented in the diagram which shows that the emmetropic eye is myopic for green and hyperopic for red. A hyperopic eye sees green clearer, and a myopic eye sees red clearer.

In a perfectly emmetropic eye, therefore, the green and red lights will not be brought to an exact focus on the retina, but will be seen slightly blurred, both, however, to the same extent; in

The value of the test is not affected by color blindness, as long as the patient can distinguish a difference in the colors. This is due to the fact that the chromatic foci of the eye depend only on its size and on the properties of its refractive media.

There is a tendency for the patient to strain in order to read letters in the white light test, thereby exerting accommodation. The problem of accommodation in subjective tests is largely overcome in the duochrome test for the

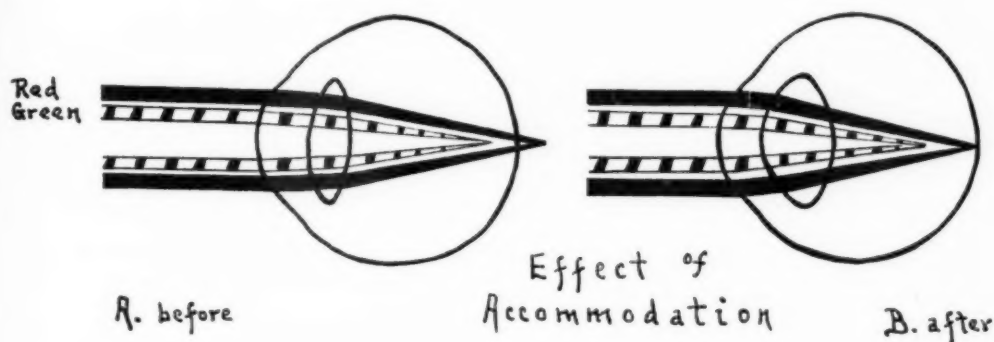


Fig. 6 (Jacobs). The effect of accommodation. A, before accommodation, showing the green ray focused in front of the retina and the red ray behind it. B shows the red brought to a focus on the retina by an accommodative act which brings the green focus still farther in front of the retina.

other words, both colors will be equally soft. The intervention of a 0.12 diopter spherical lens, concave, to focus the green, and convex, to focus the red light, will result in displacing the opposite color further away from the retina, and thereby increasing the blurring. This is shown diagrammatically in figure 5.

Inasmuch as one light focus recedes as the other is brought nearer the retina, the test is twice as sensitive as when white light is used; a 0.12 diopter lens produces the same change as a 0.25 diopter lens with white light. In addition, the monochromatic light is more sharply focused than is white light, which latter, because of its composite nature, does not form a truly sharp image at any point. This fact makes it possible to determine the axis and amount of astigmatism with greater precision in small errors.

following reason. A slight accommodative effort brings the red to a focus on the retina, while at the same time, the green is focused farther in front of the retina and hence is blurred. Any additional effort to accommodate increases the blurring of the green so that the attempt to accommodate is discouraged.

The blue cobalt glass chromatic test was based on the same general principle. Cobalt glass, by absorbing the middle portion of the spectrum, admits the passage of both red and blue rays. A hyperopic patient sees a light through the glass with a blue center and red periphery; a myopic one sees the light with a red center and blue periphery, the central stronger color being the one in focus. This test gives only an approximate idea of the refraction, and is valueless in determining astigmatism, so that it has passed into disuse.

Description of apparatus



Fig. 7 (Jacobs). The Brown duochrome refraction apparatus.

The apparatus pictured above consists of a wooden box about fifty centimeters square and twenty centimeters deep. Near the top there are two horizontal rows of black letters; the upper on a green glass background, and the lower on a red glass background. The letters are of three sizes: fourteen by seventeen millimeters; ten by thirteen millimeters; and seven by eight millimeters; corresponding approximately to the sizes of Snellen types on the twelve meter, nine meter, and six meter lines respectively. Rectangular blocks each four and one-half by ten centimeters are arranged radially below in the form of a semi-circle with convexity upward. On each block are three black stripes six millimeters wide and spaced six millimeters apart, running almost the length of the block. The upper half of each block is on a green glass background, and the lower half on a red glass background. There are seven of these blocks arranged radially thirty degrees apart and numbered clock-fashion from nine to three. Fitting into the concavity of the semi-circle of blocks is a revolving wooden disc containing a rectangular block nine by fourteen centimeters with five black stripes each seven millimeters wide, and with the same color arrangement as in

the radial blocks. This disc is revolved by remote control by means of cable, pulleys, and weights. The box around the lower half of the revolving disc is graduated from 0 degrees to 180 degrees. The colored glass throughout is backed by a milk-white glass to effect a homogeneous diffusion of light. The green glass is in two thicknesses in order to equalize the illumination. Illumination is obtained by eight electric lamps arranged inside the box and wired in three separate circuits—one for the letters, one for the radial blocks, and one for the revolving block, so that any or all may be illuminated by remote control switches.

There is a black stripe separating the colored halves of the blocks which may confuse the patient, and might better be omitted. The apparatus is wired according to European standards. It was necessary to rewire it and replace the sockets with those used in this country.

Technique of test

After central visual acuity has been estimated by the methods commonly employed, the patient is seated six meters from the apparatus. I have found that best results are obtained with the room fairly well darkened. The colored panels with their black letters are illuminated, and the patient asked to state which letters are clearer. He will answer that they are equally distinct, or that the letters on the green, or on the red background are clearer. If both are equally clear, there is either no refractive error, or there is a mixed astigmatism with equal hyperopia and myopia. If the letters on the green background are seen better, hyperopia with or without astigmatism is indicated. If the letters on the red background are clearer, myopia with or without astigmatism, is indicated. It may be mentioned here that the visibility of the letters depends on the focusing of the colored background on the retina. The nearer the focus the better the definition of the letters, because of diminution of diffusion circles. Inasmuch as this test is purely comparative, it is suggested that the

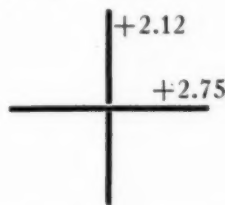
same letters be represented in both rows, instead of having different letters as is the case in this apparatus.

The radial blocks are next illuminated. If the patient sees the black stripes in the green halves of the blocks better, he is asked which stripes are sharpest. If they all appear equally distinct, the case is one of simple hyperopia. If the stripes in the red halves of the blocks are sharpest, and all appear equally distinct, simple myopia is present. If the stripes on one color of one or more blocks are clearest, astigmatism is present. If the stripes on the red halves of the blocks are sharpest in one meridian, and the stripes on the green halves are sharpest in the opposite meridian, mixed astigmatism is indicated; if the intensity of the stripes in this instance is the same, then the mixed astigmatism has the same amount of hyperopia and myopia. Those stripes which are most distinct are at right angles to the more emmetropic meridian. These preliminary observations are purely qualitative in character and apt to vary in accuracy. The actual measurement of the refraction is the next and most important step.

The revolving block is now illuminated, and if the eye under examination is hyperopic, the block is turned to the position in which the stripes on the green halves of the blocks are seen most distinctly. Suppose this position is vertical; this principal meridian is checked by revolving the block slightly in each direction until the stripes are seen best; the true axis is now read off on the scale. Convex lenses are placed in the trial frame until the patient sees the stripes in the red half of the revolving block best; the sphere is reduced by 0.25 diopter, which will probably make the patient uncertain. We may consider the point of equalization reached when the patient answers "red" to the addition of +0.12 D.sph, and "green" to -0.12 D.sph. The sphere so determined represents the strength of the horizontal meridian. The block is now turned into position with stripes horizontal or at right

angles to the first principal meridian, and the vertical meridian is refracted in the same manner. The rule here is: the lens with which a given set of stripes is seen distinctly, measures the refraction of the meridian at right angles. It will be observed that the refraction of each of the two opposite meridians is obtained when the black stripes on the green and red halves of the revolving block are seen with equal distinctness. The strength of the two principal meridians is all that we seek to determine in refraction. If the stripes on the green half of the block are more distinct, the plus sphere required to equalize the clearness of the stripes on both green and red halves of the block, is the measure of hyperopia in the opposite meridian. If the stripes on the red half of the block are more distinct, minus spheres are used to measure the myopia in the opposite meridian. This procedure accomplishes the focusing of the opposite color, as hereinbefore explained.

Example: Suppose +2.75 D.sph. is required to equalize the clearness of the stripes with the revolving block in the vertical position, and +2.12 D.sph. required to equalize clearness of stripes with revolving block in horizontal position. This may be expressed graphically, and is equivalent to +2.12 D.sph. \approx +0.63 cyl. axis 90°.



This combination represents the correctible refractive error, and will give the maximum central visual acuity which it is possible to obtain with the eye under examination.

In high errors add plus or minus spheres until the letters can be read, and proceed as above. If none of the letters can be read by the addition of spheres, and if the case is one of high astigmatism; illuminate the revolving block and turn until the stripes are

sharpest—they are now at right angles to the meridian of least error. Refract, and turn the block through 90 degrees and ask in which color the stripes are sharpest; refract as before. In very high errors of astigmatism the stripes may not be visible. In this case the increased width of the colored halves of the block indicates which color is more out of focus. If the green is wider, minus spheres are placed in the trial frame until both appear equally distinct. If the red is wider, plus spheres are required to secure equal definition.

After determining the refractive error, the visual acuity is taken in the usual manner with this correction before the patient's eye.

It will be noticed that the refraction is performed with spheres only. Cylinders may be used to balance the revolving block, but it is quicker to use spheres. The error due to memorizing letters, which is possible with the usual method of testing with a Snellen chart, is eliminated in this test. The duochrome method of refraction arouses the interest of the patient, who, especially if he has had previous examinations, is liable to become quite bored by the reading of letters. The patient simply has to make comparisons, and as these are simultaneous, he more easily detects slight differences. Being a subjective test, it is evident that like all subjective tests, the patient's co-operation, and also in this case, his judgment, influence the accuracy of the refraction.

The apparatus is patented and manufactured by Clifford Brown, Ltd., 45 Wigmore street, London.

Comparative tests made with duochrome and white light method

After mastering the technique of the test, I made a comparison with the method commonly employed in a series of cases in the office of Dr. William H. Wilder and Dr. Thomas D. Allen; and I wish to thank them for their helpful cooperation which made this work possible. My method of procedure was as follows:

1. Manifest refraction with white light (Snellen chart).
2. Manifest refraction with duochrome test.
3. Retinoscopic examination.
4. Homatropine refraction with white light (Snellen chart).
5. Homatropine refraction with duochrome test.
6. Post cycloplegic refraction with white light (Snellen chart).
7. Post cycloplegic refraction with duochrome test.

A total of 416 comparisons was made as follows:

By manifest refraction 146 eyes.
By retinoscopy 114 eyes.
By homatropin refraction .. 114 eyes.
By post cycloplegic refraction 42 eyes.

The patients under examination ranged in age from 7 to 76 years and were of average to superior intelligence. The cases for this experiment were not chosen, but were taken as they presented themselves in the office, with the exception of very young children, who were excluded.

Illumination was obtained in these tests by using frosted electric lamps of forty watts each.

The results obtained are summarized in table 2; the duochrome test be-

Table 2

	Average variation			Extremes of variation in individual tests		
	Sph.	Cyl.	Axis	Sph.	Cyl.	Axis
	Diopeters		Degrees	Diopeters		Degrees
Manifest refraction	—0.15	—0.005	2.1	{ +0.50 —0.75	{ +0.50 —0.50	45
Homatropine refraction	—0.11	—0.016	1.8	{ +0.25 —0.75	{ +0.50 —0.50	30
Post cyclop. refraction	—0.16	—0.03	2.0	{ +0.25 —0.50	{ +0.25 —0.50	30

ing compared with the white light (Snellen chart) as standard.

Retinoscopic examinations were made on 114 homotropized eyes. Comparison of the white light (Snellen chart) and duochrome tests with the retinoscopic findings under homatropin are given in table 3.

4180 to 5900 A.U., the red limits from 5900 to 7300 A.U. The green limit was therefore 1720 A.U. and the red limit 1400 A.U. from the sodium line (5900 A.U.). This increased distance of the green focus from the retina as compared with the red focus, would render the results slightly myopic and ex-

Table 3

	Average variation from retinoscopy			Extremes of variation in individual tests		
	Sph.	Cyl.	Axis	Sph.	Cyl.	Axis
	Diometers		Degrees	Diometers		Degrees
White light (Snellen chart)	+0.02	+0.004	0.9	{+0.50 -0.25	+0.25 -0.50	10
Duochrome	-0.08	-0.01	2.4	{+0.50 -0.75	+0.50 -0.75	30

Conclusion

In reviewing these comparisons, it will be seen that in this series of cases, the Brown duochrome test gives results about 0.12 D. more myopic than the white light (Snellen chart), as the latter is performed in this office. The difference in the cylinder is much less than this and with the slight difference in axis, may be disregarded. Approximately the same difference exists when the two tests are compared with retinoscopic findings under homatropine. A study of the wavelengths of the green and red light used in this test was made by means of a Bausch and Lomb spectrometer, through the courtesy of Mr. William Barker of that company. The green limits were from

plain the variation found in this series of tests.

I am of the opinion that in skilled hands the two methods of refraction are productive of results which are equally accurate, after allowing for the small spherical variation as determined by this experiment. The advantages of the duochrome method have been mentioned. The time element is about the same in both methods. It is important that the patient be made to understand what is required of him, namely that this is a comparative test and that his attention be concentrated on the distinctness of the stripes. This will require a little more explanation than in testing by white light with the Snellen chart.

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References

- Brown, Clifford. Ltd., London, Brown's duochrome refraction test.
 Houstoun, R. A. Light and color. 1923, chap. 1, 2, and 3.
 Imbert, René. La chromptométrie. Lyon, 1929.
 Pech, J. L. La valeur physiologique et clinique des aberrations chromatiques de l'oeil. Arch. d'Opht., 1930, June.
 Von Helmholtz. Treatise on physiological optics. 1911, v. 2. chap. 19.

THE TECHNIQUE OF THE PROLONGED OCCLUSION TEST

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A careful description is given of the author's occlusion test by which the full amount of latent phorias can be measured.

When the writer began, thirty-eight years ago, to adopt a prolongation of the cover or screen test for the diagnosis of the kind, and the measurement of the degree, of muscle imbalance, he measured only the phorias for six meters in the ordinary way at the preliminary test, and tested them again at the end of the occlusion period. It soon became apparent that the results of this simple procedure were greatly superior to those obtained when reliance was placed on the ordinary short tests.

The following modifications and additions were however gradually adopted. For instance it was found advantageous to make a daily test of the lateral and vertical deviations at six meters. A curve then could be worked out showing when relaxation began and when stability was reached or approximated. Thus it became apparent that the duration of the test necessary to bring about relaxation of the muscles varied greatly in different cases, in some the deviation becoming fully manifest in twenty-four to forty-eight hours, in others, and much more commonly, the relaxation being more gradual, sometimes not commencing until several days had elapsed, and taking from one to two weeks or more to become stabilized. It showed, moreover, that the relaxation was rarely uniform from day to day though the general trend of the deviation was in the same direction. To give an example; an exophoria arising out of a pre-occlusion orthophoria and amounting to four degrees on the fourth day, fell back to three degrees on the fifth day, and rose to five and a half degrees on the sixth, and again fell to four and a half degrees on the seventh, from that point rising without relapse until the twelfth day when it amounted to eight degrees, and remained at that point

for the last five days of the test. In some cases in which no relaxation of muscle took place, the persistence of the symptoms, evidently due to eye-strain, made it probable that the occlusion was for too short a period. The general conclusion to be arrived at from those cases in which daily observations were made is that the occlusion period should not be less than one week.

The tests lasting from one to three days recorded by some writers on this subject are altogether too short to give reliable data, although no doubt they furnish in many cases observations of more value than those of the ordinary short tests.

It must be remembered that the deviation many eyes are subject to when they become blind, which is the pathologic basis for this test, usually takes more than a few days to develop. The test should be maintained for at least a week, and when possible until the relaxation becomes stabilized.

In the early stage of its development the test consisted only of (1) the demonstration and measurement of the error at six meters. Later it was found desirable to measure at the pre-occlusion test (2) errors at one third meter; (3) the relative sursumductions and sometimes the abduction; (4) to compare the vertical deviation in the four oblique positions, and (5) to measure the near point of convergence.

These tests are all made with a full correction of the refractive error in the trial frame, and it is desirable also to combine with the correction, except when of very low degree, stenopaic discs with a horizontal slit not more than three millimeters wide to be sure that the visual lines pass as nearly as possible through the optical centers of the lenses. Otherwise a faulty position of the head may introduce a consider-

able vertical error. It is important that this should be done both at the pre-occlusion and postocclusion tests.

When these observations and measurements have been recorded, the patient is advised of the necessity of carrying out the test without any break in it, and also of the loss of judgment of distance and the consequent necessity of care in going up and down stairs and the like. The dominant eye is then determined by making the patient sight a light through a small ring held at arm's length, both eyes being open, or by some similar method.

Most right handed people are right eyed, but there are a good many exceptions, and the dominant eye does not always coincide with the eye with the higher visual acuity. When the object of this test and its *modus operandi* have been explained to the patient in very simple language, the nondominant eye is occluded by having its spectacle lens replaced by a ground glass, preferably a smoked ground glass, or by pasting a piece of black paper or some dark material on the back of the glass, or by a black patch. The light coming in at the sides, though annoying to some patients, is of no importance so far as the efficiency of the test is concerned. As a matter of fact a ground glass is quite efficient and much less conspicuous than any other device.

If possible a test of the six meter phorias is made every twenty-four hours. A full correction of the refractive error is placed in the trial frame with a Maddox rod in one cell for testing the vertical error, to be replaced later by a vertical prism for testing the lateral deviation. The patient is directed to close the eyes until this trial frame is in place. At the end of the occlusion period a series of tests corresponding with the preocclusion tests is made. This consists in:

1. The phorias at six meters.
2. The phorias at one-third meter.
3. The relative sursumduction, and sometimes abduction.
4. The hyperphoria in the four oblique positions.
5. The near point of convergence (p.p.c.).

Of these observations the determination of the six meter imbalance is doubtless the most important, for in those early cases in which this alone was determined, the results gave a high percentage of success, but the test at the reading distance and in the reading position usually shows a much higher degree of exophoria, and often a different (greater or less) degree of hyperphoria than obtained in the six meter tests, explaining some of the failures to obtain relief for nearwork when the distance findings alone are taken into consideration.

The determination of the relative sursumduction is of great value and assists very much in the determination of the amount of correction to be given the hyperphoria. There are often large differences in the preocclusion and postocclusion measurements. In measuring the sursumduction note should be made of the points at which doubling of the image occurs on ascending and resumption of single vision on descending. It is very exceptional for the change in sursumduction not to correspond very closely with the hyperphoria developed by the test.

The measurement of the preocclusion and postocclusion abduction has no practical bearing on the management of the case and is of academic interest only, the most interesting thing about it being that the preocclusion abduction is often markedly of lower degree than the postocclusion exophoria. In other words the preocclusion prism abduction is not a guide to the amount of exophoria. It is quite unusual for the occlusion test to make any material difference in the near point of convergence.

The comparison of the hyperphoria in the four oblique positions is of much importance. It is very rare for it to be the same in degree all over the field. Sometimes it will be found excessive in the direction of action of one only of the vertically active muscles but in many cases a double hyperphoria will become apparent, the hyperphoria however being of higher degree on one side than on the other. This assists in

determining the eye before which the correcting prism should be placed.

By attention to the above findings it was thought that the nature of the case could be solved with reasonable certainty, but in many of the patients more recently under observation another modification has been made, namely, the occluding of one eye after the other.

The result has been to show that in some cases there is a definite insufficiency of one muscle on one side only, and that if the insufficient muscle be put out of action by occlusion, we may find no deviation at all, or a very low one, whereas if the insufficient muscle be allowed to function a deviation of marked or even high degree may develop. In other words in the former instance we have the primary deviation and in the latter the secondary, an observation which assists in locating the muscle at fault.

Furthermore alternate occlusion may result in showing an error of a similar kind on both sides and in many cases we have a hyperphoria of one kind when the left eye is covered and of another kind when the right eye is covered. In other words we have further evidence of a double hyperphoria, presumably an insufficiency of vertically acting muscles on each side, confirming as a rule the observations made by comparing the hyperphoria in the oblique positions.

One other observation has been made also as a result of alternate occlusion and that is that in some cases, but not in all, the patient is much more comfortable with one eye occluded than with the other, in one case there being complete cessation of severe neurasthenic symptoms when the left eye was occluded and an immediate return of them when the occlusion shifted to the other eye.

The technique then which the writer would suggest, a full correction of the refractive error being assumed, is as follows:

Preocclusion tests

1. Test for phoria at six meters.
2. Test for phoria at one-third meter.

3. Measure sursumduction, ascending, descending, and abduction.

4. Comparison of hyperphoria in four oblique positions.

5. Measure the near point of convergence (p.p.c.).

Then occlude one eye, preferably the non-dominant, and give instructions to patient.

Make daily observations of six meter phorias when possible.

When stability appears to have been reached, change occlusion to the other eye and again make daily observations for a period to be determined by the judgment and experience of the ophthalmologist.

At the final test:

1. Record the phorias at six meters.

2. Record the phorias at one-third meter.

3. Measure sursumduction and abduction.

4. Compare the hyperphorias in the four oblique positions.

5. Measure near point of convergence.

If these suggestions are carried out with care the observer will soon realize that he has entered a field, the surface of which has been scarcely scratched by the methods previously in use.

This may seem to be a very strenuous procedure to those who have had no experience with it. It may also be thought a difficult matter to get patients to accept it. As a matter of fact this is far from being the case. It is true that the patients must be carefully selected. They must be intelligent enough to understand the test and be convinced by previous failures that the methods ordinarily in use will not avail them any more in the future than they have in the past, and be willing to carry it out with the necessary care. Experience shows that most patients accept it readily and often with enthusiasm, and become interested in it as it proceeds.

Neither the strenuousness of the test nor the attitude of the patient is a bar to its use.

In this paper the term "insufficiency" has been used in preference to "paresis" or "partial paralysis." The latter terms carry with them the suggestion that muscles originally normal in function, have suffered loss of power or partial paralysis. Now hyperphoria is far too common a phenomenon to be accounted for in this way. In 700 cases examined by the occlusion test hyper-

phoria of one-half degree or more was present in 84 percent, a percentage larger than that of exophoria (78 percent). It is extremely improbable that very many of these cases were paralytic in character. Moreover the common symptom of an oculomotor paralysis is diplopia. The absence of this symptom is one of the most marked characteristics of latent imbalance. Neither is there any history of diplopia or of any sudden onset of the symptoms in the past.

It would seem that exophoria, hyperphoria, sursumduction, deorsumduction, and prism abduction can be better explained by assuming that they are all vestigial conditions. These muscle anomalies serve no useful purpose in man, though in an early evolutionary stage, when circumferential vision was useful for the safety of the individual and the preservation of the species, they were no doubt of high value. In other words they are in man nonpurposive and can therefore be classed as vestigial.

Variation is one of the most important and well known laws of nature. As Darwin has shown, some variations are favorable and others unfavorable, and moreover that rudimentary or vestigial structures and functions are par-

ticularly liable to variation. That would account for the great differences in abduction and sursumduction in various cases. Orthophoria is, of course, the most favorable variation, permitting single vision in the easiest possible way, but it is no more normal or natural than the less favorable variations exophoria and hyperphoria. People who are the subjects of these less favorable variations have a heavier load to carry. The fact that some carry the load more easily than others do, and show no symptoms, in no way lessens the importance to the latter of lightening their burden. The same is true of course of errors of refraction.

Criticisms of interest and sometimes possibly of value have appeared from time to time, but the precise value of those of an adverse character would have been more apparent if the amount of actual experience, if any, in the use of the test on which they were based had been stated. This has usually not been done. As a matter of fact most adverse criticisms, notably those by Duane and Maddox, appear to have been made on theoretical grounds only.

This communication is based on the examination of over 1500 patients by this method.

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TONOMETRY BEFORE AND AFTER CATARACT OPERATION

DR. HORACIO FERRER
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(TRANSLATED BY DR. W. H. CRISP)

The use of the tonometer routinely in the examination of eyes preliminary to cataract extraction is advised. In the majority the tension will be found normal and choice of operative procedure is unrestricted. In those with subnormal tension it is advisable to dilate the pupil widely with atropin to promote ease of delivery of the lens which is liable to be luxated by pressure. In eyes showing notable increased tonus atropin is a source of danger. The tension should be lowered by suitable measures before extraction of the lens. Tonometric measurement may be made by the twelfth postoperative day if anything abnormal is noticed. The use of atropin is objectionable before or after dissection. It is never necessary and frequently dangerous, as hypertension is apt to follow this operation due to imbibition of aqueous into the vitreous. Read at the third congress of the Pan-American Medical Association, Mexico, July, 1931.

The ophthalmologists who practiced in the later years of the last century were disposed to believe that everything of interest that could be said had already been written with regard to cataract extraction; and in fact, so much literature had been published on the subject, with such a wealth of detail, and setting forth the observations of so many eminent clinicians of every country, that the theme appeared exhausted. Nevertheless, in the third of a century which is now almost a matter of history, the literature of the subject has been so greatly enriched with new works that it is difficult to keep in touch with all of them, and if it is true that what has been published contains much repetition and redundancy, at the same time it is also certain that there have been positive achievements which contribute materially to the operative outcome, improving the end results and the visual acuity of our patients.

The fight between the two great surgical methods, the extracapsular and the intracapsular, is today more ardent than ever, and much time will elapse, with improvement of instruments and of operative technique, before the cherished ideal of complete extraction can be declared triumphant, and acceptable at least as the method of election in the majority of cases. Up to the present, although most of us use both methods, it is proper to recognize dispassionately that the greatest average practical utility is still associated with extracapsular extraction.

Among the real improvements, avail-

able for either method, we must first call attention to akinesia of the orbicularis muscle, most conveniently obtained by the Van' Lint technique. Akinesia represents a great step in advance, because by avoiding violent contractions of the orbicularis muscle we eliminate one of the most frequent causes of loss of vitreous.

Corneal suture is another progressive measure. Practiced since the last century, it has become a routine procedure only during the past few years. The methods followed for suturing the operative wound vary considerably, but in large part the variations chiefly satisfy the personal vanity of the author. Of all methods of suturing the corneal flap the best is that of Liégard.

The use of hooks to separate the lids, Guist's blepharostat as modified by Melville Black or by Arruga, and retrolbulbar injection are small details which yield more or less important advantages.

Tonometry before cataract operation, introduced by me as a routine practice in extraction of the lens in the year 1926¹, is a definite improvement, has rapidly become general, and is followed today by a large number of operators in every country. It may be admitted that every careful operator had already made a practice of investigating intra-ocular tension by means of bidigital palpation before opening an eye for the extraction of cataract, but the systematic use of the tonometer reveals to us in a much more perfect fashion the actual condition of ocular tonus, and

puts us on guard against hypertension or hypotension.

If we analyze the causes of loss of vitreous during extraction, we shall find it convenient to classify them in three groups: (1) those which depend upon the operator; (2) those arising from intractability of the patient; and (3) those which depend upon abnormal tension of the eyeball. The causes included in the first group can only be eliminated by experience and scrupulous care. Those of the second group become much less significant with the use of akinesia and with tactful handling of patients, inspiring them with confidence to the point of dominating their will power. The causes included in the third group are completely controlled by preliminary tonometry. Any good tonometer will serve this purpose, bearing in mind that of the three most frequently used tonometers, that of Schiötz, that of Bailliart, and that of MacLean, the two first indicate normal limits as between fifteen and thirty millimeters, while upon the scale of the third the normal limits lie between twenty-two and forty millimeters. When we proceed to operate upon an eye the tonus of which is at or below the lower limit, it is advisable to dilate the pupil widely, because, if this is not done, when we come to seize the capsule, if we are operating with forceps, or during pressure upon the lower part of the lens, if we select the extracapsular method, the lens becomes depressed, sinking a little because of inadequate tension in the vitreous chamber, and is easily luxated if the pupil is not fully dilated, and it is necessary to overcome the resistance which the iris opposes to its exit. In these cases it is convenient to atropinize the eye the previous evening and also on the day of operation.

When the ophthalmotonus is normal, which occurs in the immense majority of the cases, extraction is performed with the greatest facility and the operator may decide upon simple or combined extraction, according to his predilection. For my part I always operate in these cases without iridec-

tomy, dilating the pupil with atropin one hour before the operation, although it is also possible to employ a collyrium of euphthalmin and cocain or of homatropin with adrenalin, as the surgeon prefers.

The course to be followed is very different when the tonus is at or above the upper limit. In the first event I bring down the tension a few millimeters by injecting one cubic centimeter of a solution of novocain with adrenalin behind the eye ten minutes before making the section, and if this is not sufficient I do combined extraction. In the second contingency, when there is a considerable hypertony, we ought always to do preliminary iridectomy and then extract the cataractous lens a few weeks later. No one should employ atropin in these circumstances. The use of atropin systematically upon the day of operation and at the early dressings to prevent iritis, adhesion of capsular remains, and so on, as advised by many authors, is the most frequent cause of the glaucomas which are observed in the first weeks after extraction. To open a hypertensive eye for extraction of cataract without having previously undertaken to lower the tension, is a crime; and to use atropin in the days immediately following is a greater crime.

After the appearance of my first work putting forward this doctrine and recommending that the operator should never neglect taking the tension of the eye with the tonometer before practicing cataract extraction, a large number of ophthalmic surgeons expressed their opinion regarding this contention, either in books, or in articles published in the scientific press, or in letters which they sent to me personally, and in every case these opinions supported the principles which I had put forward. They were attacked only by my compatriot Dr. Guiral, who summarized his opinion in the following words: "If upon examining a person with total cataract we discover that the tension of the eye is normal, we may indicate that he can be operated upon when he wishes; but if on the contrary, exami-

nation discloses that the tension is higher than that regarded as normal, not by a few millimeters, but by ten or more, the only thing that we are obliged to recommend to the patient is urgent operation." Guiral did not long remain of this opinion, for a little while later he said in the *Archivos de Oftalmologia Hispano-Americanos*, with regard to Barraquer's operation: "In every case in which I operate by this method, I watch the patient for three whole days with the tonometer (three times daily) and only in those cases in which the curve is absolutely normal every time do I proceed to operation." This categorical statement relieves me of the duty of commenting upon the previous one.

Two ophthalmic surgeons of the country in which this address was delivered have contributed to our knowledge of tonometry. The eminent ophthalmologist Max Weihmann, who practices in the Mexican capital, published in 1927 in the *Klinische Monatsblätter für Augenheilkunde* a lengthy article in which he reported my tonometric observations, and which has contributed much to making them known in Germany, and at the same time he published a very interesting series of personal experiences of operations done at high altitudes, as in Mexico. My excellent friend Dr. Mendoza published another article entitled "My opinion concerning preliminary tonometry", which served to widen still further the knowledge of this detail of technique in Spanish-speaking countries.

Before going further I wish to insist upon a detail of my work which has not been well understood. I have been told that upon making the corneal incision the intraocular pressure at once ceases, becoming equalized by that of the atmosphere. This is a mistake. The aqueous chamber is completely separated from the vitreous chamber by a partition composed of the ends of the ciliary processes, the hyaloid, the zonula, and the crystalline lens; upon cutting the corneal flap the aqueous chamber comes into communication with

the atmosphere and is therefore subjected to the same pressure as the atmosphere, but the vitreous chamber, which composes five-sixths of the eye, not being in communication with the aqueous, conserves a greater tension, although it yields somewhat by the elasticity of the zonula, and this is the reason why upon doing cystotomy or capsulectomy we see the cataract displaced slightly forward, propelled by the pressure of the vitreous chamber, this effect being more pronounced the greater the tension in the vitreous.

In the postoperative course after cataract extraction the tension varies a good deal; sometimes it is diminished, evidence almost always of an iritis, and at other times it increases, due probably to inflammation connected with cortical remains or with imbibition of the aqueous into the vitreous. When the process of cicatrization has been normal, after the twelfth day one can take the tension with the tonometer without fear of provoking rupture of the recent cicatrix, and we shall thus have a valuable guide for resorting to the use of mydriatics or miotics without exposing ourselves to misleading judgment from bidigital examination. There is naturally no necessity for doing postoperative tonometry unless we notice something abnormal.

In 1929² I published my observations concerning tonometry in connection with operation upon secondary cataract. It is astonishing that in almost every text we are advised, before doing discission of secondary cataract, to dilate the pupil with a solution of atropin. This practice is detestable, and is responsible for the greater part of the glaucomas which are seen after discission. The operation, in itself, frequently provokes hypertension and sometimes glaucoma, through imbibition of aqueous into the vitreous, and if in addition we have previously atropinized the eye serious consequences do not fail to appear. Atropin is never necessary in the practice of discission and is frequently dangerous. With the use of a collyrium of cocain and euphthalmin one obtains sufficient mydriasis to see

very well what is being done during the operation and to avoid iridocapsular adhesions. From the third day after operation one may investigate the ocular tension in these patients, and act accordingly.

I trust that this article will serve

once more to call attention to the importance of tonometry in relation to the cataract operation, and that it will increase the number of ophthalmic surgeons who are benefited by the practice of this procedure.

Avenida de Wilson y L.

References

- ¹ Ferrer, Horacio. Amer. Jour. Ophth., 1926, Nov., and Arch. de Oft. Hisp.-Amer., 1926, Sept.
- ² Ferrer, Horacio. Prevencion y tratamiento de la catarata secundaria. Rev. Cubana de Oft. y Oto-Rino-Laring., 1929, March.

PULSATING EXOPHTHALMOS

ANATOLE KOLODNY, M.D., Ph.D.
SIOUX CITY, IOWA

Ligation of the internal and external carotid arteries and the superior ophthalmic vein is recommended for the relief of this condition when due to arteriovenous communication.

Numerous reports of pulsating exophthalmos have appeared since the first publication of Benjamin Travers in 1809. However, the question of treatment of this condition is not as yet solved and every additional case is of great interest.

The frequency of pulsating exophthalmos is rapidly increasing with the number of head injuries due to automobile accidents. Although the diagnosis is easily established by the classical triad, subjective and objective bruit, exophthalmos, and pulsating of the eyeball, many cases remain undiagnosed and unremedied. The pathology of the condition may be either an arteriovenous communication or an aneurism of the internal carotid artery within the cavernous sinus. There can be no doubt that a few cases recover spontaneously and some after simple arterial compression of brief duration. I have recently observed such a spontaneous recovery in two children of six and eight years of age. Apparently, some cases recover as a result of surgery limited to the orbital vessels. The majority of the cases, however, especially with a more pronounced condition, require more radical treatment.

Then, the main interest centers around the dangers of carotid occlusion.

The ideal treatment of an arteriovenous communication—ligation of the artery and vein both proximal and distal to the lesion—is, of course, impossible in these cases. In the past, most cases were treated by a ligation of the common carotid artery on the involved side. However, for anatomical reasons, such a procedure is inadequate. The external carotid artery anastomoses freely with its fellow on the opposite side. This anastomosis allows a retrograde blood stream down the external and up the internal carotid artery on the involved side. The suggestion of some authors to ligate the internal carotid artery alone is altogether untenable because of rich communications between large branches of the internal and external carotid arteries. The arteria supraorbitalis, arteria dorsalis nasi and arteria frontalis of the internal carotid artery freely communicate with the arteria temporalis superior and arteria angularis of the external carotid artery. After the internal carotid artery is ligated, the blood will flow through the external carotid artery and the involved segment of the internal

carotid will constantly refill through these communications. It is obvious, for this reason, that the best procedure is to ligate the external carotid artery along with the internal carotid artery. A ligation of both carotid arteries should be followed, in most cases of arteriovenous communication, by a ligation of the superior ophthalmic vein in the orbit.

Following the ligation of the external and internal carotid arteries on the involved side, the circle of Willis and especially the anterior communicant artery play an important rôle in supplying blood to the ligated portion of the vascular system. A ligation of this circle, however, is out of question since it, alone, supplies the middle cerebral artery. Following the ligation of the internal and external carotid arteries, the blood flow through the ophthalmic artery is greatly cut down.

The question of the method of occlusion of the blood vessels has been taken up in detail by several authors. Some men suggest a fascial transplant, others speak of aluminum bands. I believe that the best occlusion is accomplished by a plain ligature. The occlusion should be preceded by digital compression of the artery.

Report of a case

A man, twenty-five years of age, sustained a head injury in an automobile accident. He was unconscious for a few hours and later complained of double vision. In a few days he noticed a bruit in his head and swelling of the left eye. The patient felt as if the left eye were being pushed out of the socket with every heartbeat. When this man was referred to me, six weeks later, there was a very prominent congestion

of the blood vessels of the conjunctiva of the left eye. There was a pulsating exophthalmos. A bruit could be felt with the hand over the left temporal region and could be heard over the left temple and eyebrow. The eye-ground of the left eye showed a swelling of the disc and an exudate around the macula.

For three days, the left common carotid artery was compressed for a period of ten minutes twice daily. During the first compression, when the carotid artery was compressed sufficiently to stop the bruit in the head, the patient almost became unconscious. During the following compressions the reaction was less severe and finally the carotid artery was compressed during a period of ten minutes without noticeable reaction of the patient. The following day, the external and internal carotid arteries were ligated, on the left side. The patient stood the procedure well and at the time of his dismissal from the hospital a few days later, no bruit could be heard subjectively or objectively. Exophthalmos was still present but the eye did not pulsate. The patient returned in about a month because of a return of the bruit over the left eyebrow. At examination, the eye was still bulging but much less than before. There was no pulsation of the eye but on auscultation one could hear a faint bruit over the left eyebrow. The conjunctival veins were still congested. The superior ophthalmic vein was then ligated. The vein showed many varicosities, about a half a centimeter in diameter. Following this ligation the bruit entirely disappeared, and the patient has remained well until this time, which is over a year and a half since the last operation.

727 Frances building.

ANALOGIES AND DIFFERENCES OF THE SECOND AND EIGHTH NERVES AND END-ORGANS. GENERALIZING PRELIMINARY CONSIDERATIONS.

II ANATOMICAL

CLIFFORD B. WALKER, M.D.

LOS ANGELES

A comparative study of the eye and ear is made in regard to blood supply, bony canals, nerves, and drainage systems. The structure of the optic nerve and its surroundings is such that choked disc is produced much more readily than a similar phenomenon of the auditory or labyrinthine system. Hemorrhagic exudates and venous congestion do occur in the cochlea under the condition of increased intracranial pressure. Read before the American Ophthalmological Society, June, 1931.

At or shortly after the time when the ophthalmologist and otologist each began to devote his entire attention to the intensive study of his own subject at the expense of the other specialty, the neurologic surgeon came into the field and there occurred an overlapping field of facts interesting to all three yet perhaps of necessity more frequently explored by the neuro-surgeon than by either of the other two. Gradually each became quite conscious of gaps of knowledge in the specialties of the others in relation to his own and often expressed some regret on this account. These gaps may occur in a very irregular, and quite surprising manner, for instance, I have heard a prominent otologist express surprise that the nerve fibres grow up the optic stalk from the retina, or again the ophthalmologist will be surprised to learn that the aqueous is directly analogous to the endolymph of the ear both in formation, entrance, and egress. Or again a leading neurologist may express interest that both the eye and ear have at least one raphé and macula.

Dr. Herman Knapp⁶⁴, one of the fathers of ophthalmology in this country, is the author of the first and only paper in the English language which bears at all on this subject. His communication appeared in the last conjoined publication of the Archives for Ophthalmology and Otology, and consisted of a consideration of diseases which affect both the eye and the ear, translated and amplified from the work of Moos⁶⁵ but touched upon none of the other ramifications of possible analo-

gies or differences, many of which were not known at that time.

While one naturally takes up this subject first from the anatomical standpoint still the knowledge at the present time permits of a grouping of facts largely falling into at least six general divisions as indicated in the general outline at the beginning of this paper*.

I. The ear being purely an organ for receiving tactile or pressure sensations is much less vascular than the eye, in the ratio of approximately 25 to 1, estimated from the fact that the single auditory artery is about the same size as one of the long ciliary arteries of which the eye has perhaps twenty-five (Fig. 1). Evidently the eye is a chemical laboratory requiring a large blood supply, and while it normally handles only about one octave of vibration frequency (wave lengths of about 380 mm. to 760 mm.) as compared with the ten octaves of frequency (about 20 to 20,000) handled by the ear still it has to handle chemical reactions of photopic, scotopic and color vision together with their heat transformations as well as provide for action current equilibrium sensations, glycolysis, vitaminosis and pupilomotor activation. While there is some pigment found in the internal ear it is practically nil as compared with the

* This paper will be devoted to anatomical considerations largely, since upward of two hundred points and sixty-six illustrations, from almost as many references, have been accumulated and distributed under the various captions and will be brought into print as fast as time and space permit, in case it seems desirable.

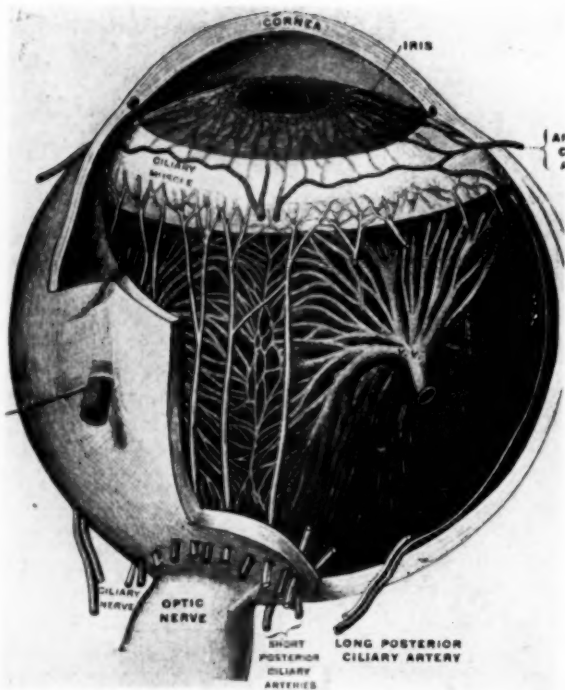


Fig. 1 A

pigment and visual purple of the eye, and apparently without function. Even if the middle ear received just as much blood as the labyrinth the eye would be at least ten times as vascular as the ear, and its sensitivity is almost in the same proportion. Knudsen estimates the eye is between six and seven times as sensitive as the ear in percentage difference detection while Ferree and Rand³¹ accept a 2 to 1 ratio as regards acuity in the most sensitive parts.

Incidentally there seems to be about ten times as much knowledge accumulated concerning the eye and its function as concerning the ear, and the methods of accurate examination of the eye and its function seem to exceed those of the ear in a

similar ratio and certainly the eye is ten times as accessible for study not only on account of its transparency but also on account of its motility and relatively soft encapsulation. In the literature the otologists refer to analogies found in the eye with respect to the ear correspondingly more frequently than the ophthalmologists refer to the ear.

II. The acoustic canal measures about 17 mm. on its longest side but often only half as much on its shortest side, which averages about 10 mm. in length and terminates in an ampullating expansion decidedly larger than the width of its entrance diameter of 5 mm. The ampullae accommodate the expansion of the cochlear and vestibular ganglions together with branches of the auditory⁴ nerve, facial nerve, and Pars intermedialis (Wrisberg). Several anastomoses occur between the superior branch

of the auditory nerve, the Pars intermedialis, and the facial nerve, exhibiting at the very start the great anastomotic tendency of the auditory nerve. However, in spite of all these nerves the acoustic canal is only loosely filled,

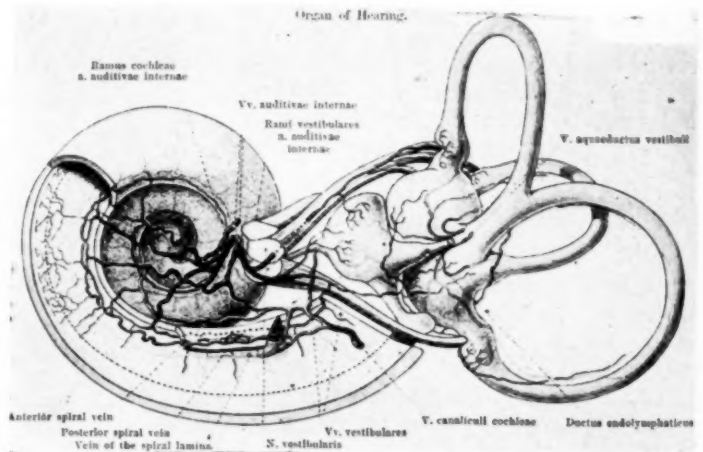


Fig. 1 B

Figs. 1 A and 1 B (Walker). For rapid comparison of blood supply as regards size and number of vessels. The eye seems to have about 25 arteries as large as the single auditory artery (Testut and Spalteholz).

as compared with the optic canal. Each of these nerves is accompanied by a small artery and the auditory artery is further accompanied by one auditory vein and by fine lymphatics but in no case are any of these vessels imbedded within the nerve as in the case of the ophthalmic vein and artery. The auditory nerve divides into five vestibular branches in addition to the main cochlear branch entering the labyrinth through separate openings. It is interesting to note that in some of the vertebrates the optic nerve likewise divides into several distinct branches with separate points of entry to the globe²⁹. The auditory artery is a branch of the basilar artery close to the circle of Willis; similarly the ophthalmic artery originates from the internal carotid near the circle of Willis. The dura, arachnoid, and pia extend along the auditory nerves to their entrance into the labyrinth after the manner in which the sheath of Schwalbe follows the optic nerve, and in both cases these arachnoidal extensions contain cell rests capable of producing meningiomas.

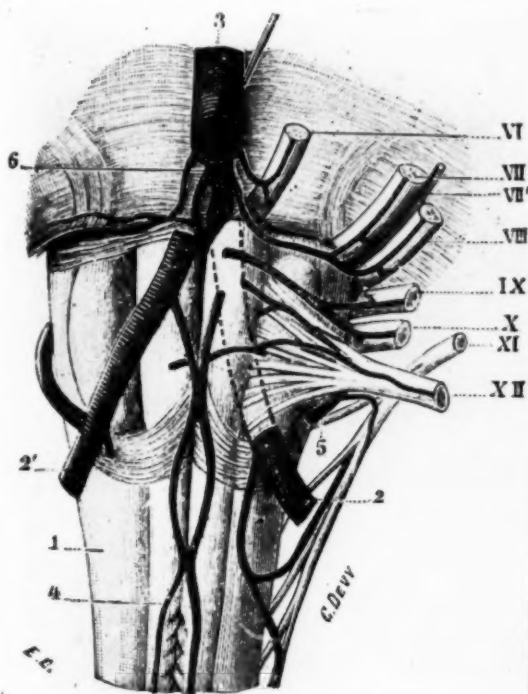


Fig. 2 A (Walker). Showing origin of auditory artery and its course without penetrating the auditory nerve. 1, Bulbus, front view. 2, Vertebral artery. 3, Basilar trunk. VI, Oculomotorius external. VII, Facial. VII', Wrisberg. VIII, Auditory. IX, Glossopharyngeus. X, Pneumogastrius. XI, Spinal. XII, Hypoglossus.

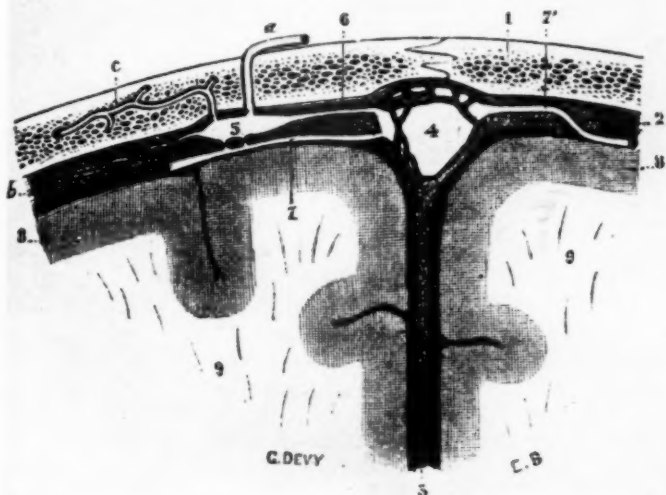


Fig. 2 B (Walker). General method of return of veins from cranial bones through and in the dura to a sinus. 1, Diploë. 2, Dura mater. 3, Falx cerebri. 4, Longitudinal superior sinus. 5, A receiving intradural lake (sanguineous): (a) One emissary vein; (b) meningeal vein; (c) diploic vein; (d) canal which anastomoses with cerebral veins (Testut).

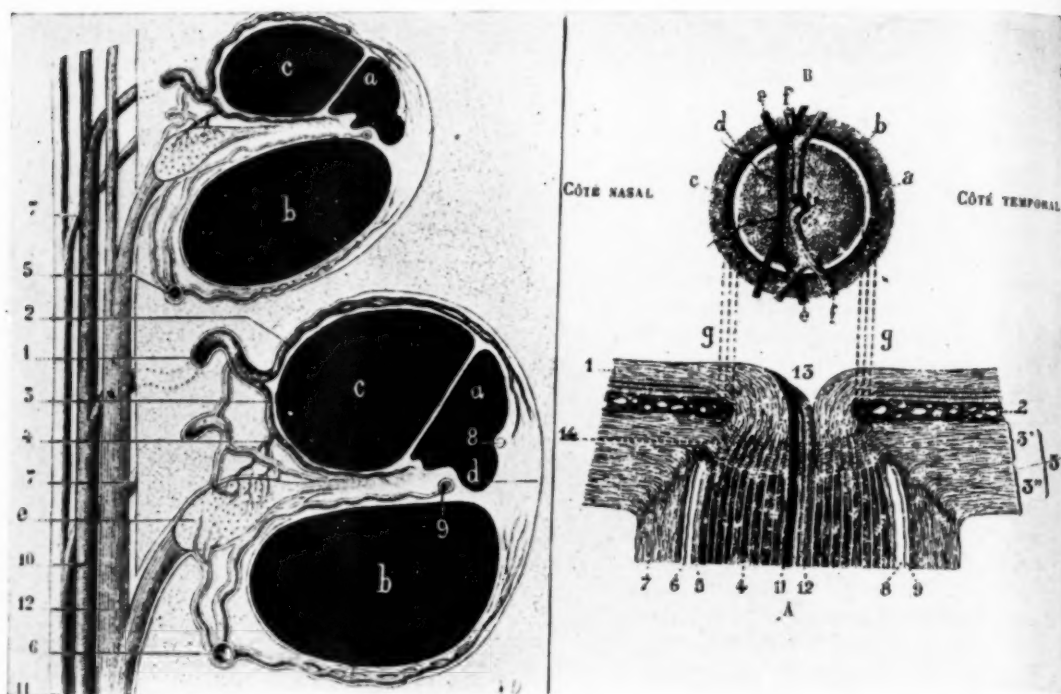


Fig. 3 (Walker). To show difference in hydrostatic principle present at entrance of nerve.

A, Arteries and veins remain distinct throughout 1, Spiral artery. 2, Its anterior branches. 3, Middle branches. 4, Posterior branches. 5, Superior spiral vein. 6, Inferior spiral vein. 7, Vein of the lamina spiralis. 8, Prominent vessel. 9, Spiral vessel. 10, Internal auditory artery. 11, Internal auditory vein. 12, Cochlear nerve. a, Scala media or endolymph canal. b, Scala tympani. c, Scala vestibuli, perilymph canals (Testut).

III. The optic foramen which in cross-section is 4.5 mm. by 6.5 mm. carries only the ophthalmic artery and fine lymphatics in addition to the optic nerve and is more snugly filled by its contents than the auditory canal yet it permits subarachnoid cerebrospinal fluid to flow freely through the canal within the sheath of Schwalbe to the plane of the lamina cribrosa. The lymphatic return for both labyrinth and optic nerve is largely to the subarachnoid spaces.

Both optic and auditory bony canals may be enlarged by new growth, as detected in x-ray studies, but according to Adson such enlargement of the optic canal is rare.

B, Artery and vein enclosed completely in a potential mechanical press. A, Scleral portion of the optic nerve. 1, Retina. 2, Choroid. 3, Sclera with —3', Lamina interna, forming lamina cribrosa; 3'', laminae externae which continue with the dural sheath of the optic nerve. 4, Optic nerve. 5, Sheath of pia. 6, Sheath of arachnoid. 7, Sheath of dura. 8, Subarachnoid space. 9, Subdural space. 11, Central artery of retina, central vein. 13, Physiologic excavation of papilla. 14, Lamina cribrosa. B, Papilla of the optic nerve: a, Physiologic excavation; b, grayish points represent lamina cribrosa; c, scleral ring; d, choroid ring; e, artery; f, vein (Testut).

IV. Venous drainage of the labyrinth is by way of three different channels: (1) the auditory vein, through the auditory canal to the superior petrosal sinus; (2) the vestibular vein to the inferior petrosal sinus or lateral sinus through the aquæductus vestibuli close to, but in a separate canal from the ductus endolymphaticus; and (3) the cochlear vein running to the inferior petrosal sinus in the canalis cotunnii, paralleling the ductus cochlearis as it travels in the aqueduct of the cochlea. None of these veins has an arachnoidal investment and although they may be exposed to some lateral pressure from

the subarachnoid space yet they are more or less protected by the dural investment. In no case therefore are they surrounded by strangulating pressure as in the case of the central vein of the optic nerve. However, those veins entering the reversible current of the petrosals, like the veins from the eye, have two possible exits. Within the labyrinth the auditory vein and the vein of the cochlear canal have an adequate anastomotic connection, and also one branch is received from the utricle and saccule, while the remaining venous return from the ampullæ and semicircular canals is quite distinct as it returns in the vena aquaeductus vestibuli in parallel with the ductus endolymphaticus. According to Politzer⁷¹ the vessels of the labyrinth near those of the middle ear anastomose through minute perforations of the thin intervening wall.

Within the eye the ophthalmic vein has practically no anastomotic connection while the venæ vorticosæ anasto-

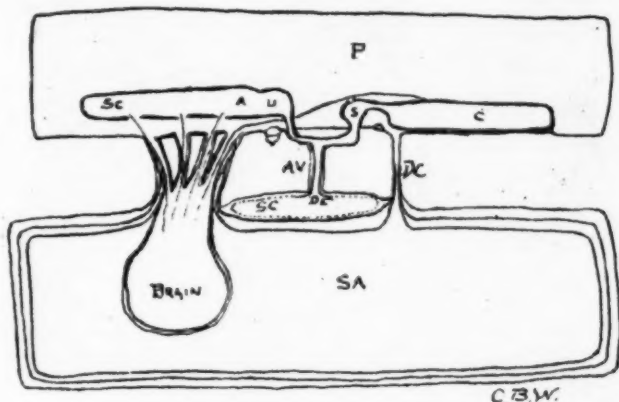


Fig. 4 A (Walker). Diagram to emphasize hydrostatics of cerebrospinal fluid, perilymph, and endolymph. *sa*, Subarachnoid cerebrospinal fluid space surrounded by subarachnoid and dura and connected with—*p*, Perilymph space by *dc*, cochlear duct. Endolymphatic space: *sc*, Semicircular canal: *a*, ampulla; *u*, utricle; *d.e.*, ductus endolymphaticus, leading to *s.e.*, saccus endolymphaticus, by way of *a.v.*, aquaeductus vestibularis; *s*, sacculus; *c*, cochlear canal.

mose freely among themselves and to some extent with the anterior ciliary and conjunctival veins. Outside of the eye the blood may return either to the cavernous sinus or to the facial plexus of veins because of free communication between the two. It can seek the line of least resistance and is therefore not af-

fectected by intracranial pressure even to the extent that the return from the labyrinth may be. Thus it seems possible to set up an analogy between the ophthalmic vein and the venæ aquaeductus vestibuli as regards their independence and drainage into a channel having a double exit, but they differ in that the ophthalmic vein is encircled by nerve, pia and arachnoid, while the venæ draining the semicircular canals may receive only lateral pressure from the arachnoid as it travels either within or on the inner surface of the dura.

The venous returns of

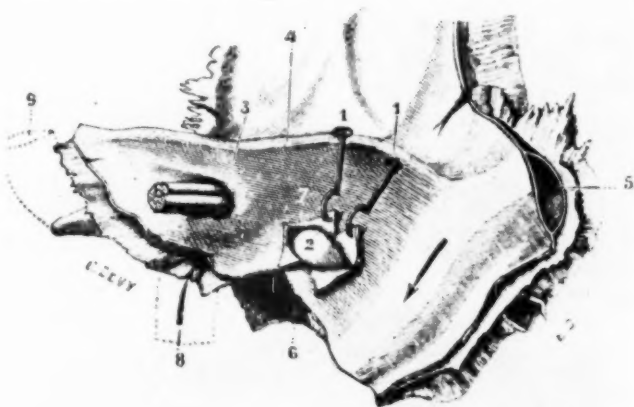


Fig. 4 B (Walker). Posterosuperior part of petrosal to show endolymphatic sac. 1, Dura mater. 2, Saccus endolymphaticus. 3, Internal auditory canal with three nerves. 4, Sinus petrosus superior. 5, Lateral sinus. 6, Posterior part of petrosal. 7, Aquaeductus vestibuli. 8, Aquaeductus cochleæ. 9, Carotid interna (Testut).

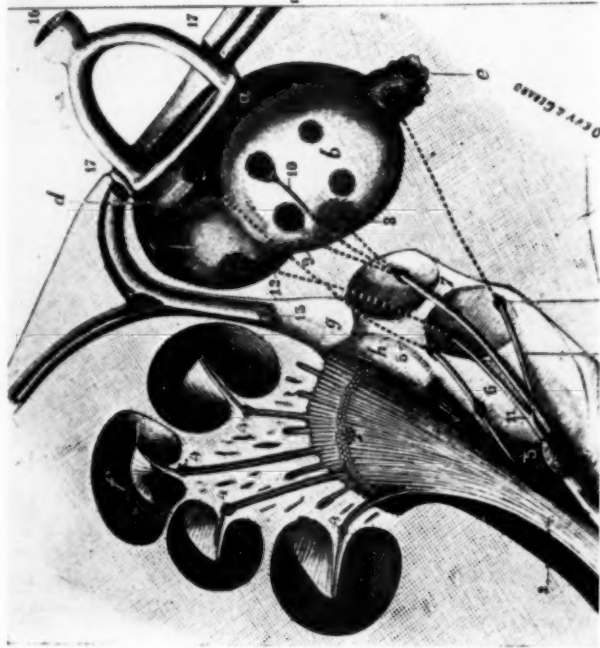


Fig. 5 A

Fig. 5 A (Walker). Sketch showing the distribution of auditory nerves. A, Vestibule with, B, Utricle, C, Saccula. D, Beginning part of cochlear canal. E, Ampulla of posterior semicircular canal. F, Cochlea. G, Aqueductus fallopii. H, Bottom of internal auditive tube with four small fossae. I, Foramen of Morgagni. 1, Trunk of nervus auditorius. 2, Cochlear branch, with 2', Superficial section. 3, Vestibular branch. 4, Corti's ganglion. 5, Small branch from the vestibular part of the cochlear canal. 6, Boettcher's ganglion. 7, Superior vestibular nerve. 8, Utricular nerve. 9, Superior ampullar nerve. 10, External ampullar nerve. 11, Interior vestibular nerve. 12, Saccular nerve. 13, Posterior ampullar nerve. 14, Scarpa's ganglion. 15, Facial nerve. 16, Stapes on the fenestra ovalis. 17, Tympanum (Testut).

Fig. 5 B (Walker). Transversal section of cochlear canal with special showing of the epithelial cells of Corti's organ. A, Scala media. B, Scala vestibularis. C, Scala tympanica. 1, Spiral ligament with: a, Insertion of the basillary membrane; b, cup of spiral ligament with section of vas prominens; c, crest of insertion of Reissner's membrane; d, Stria vasulosa with two layers—epithelial and conjunctival. 2, External spiral ridge. 3, Reissner's membrane. 4, Furrowed bandelette. 5, Internal spiral ridge, with 5', Vestibular part, and 5'', Tympanic part. 6, Foramen for the nerves. 7, Basillar membrane, with 7', Smooth zone, and 7'', Striated zone. 8, Spiral vessel. 9, Corti's organ, with 10, One of its pillars, and 10', Tunnel. 11, Membrana tectoria. 12, Internal ciliated cells. 12', External ciliated cells. 13, Deiters' cells. 14, Internal 'Claudius' cells. 14', External 'Claudius' cells. 15, Recticular membrane. 16, Epithelium of cochlear canal. 17, Lamina spiralis ossea, with the efferent canal of Rosen- that overtopped by efferent branches of Corti's ganglion. 18, Circumferential lamina (Testut).

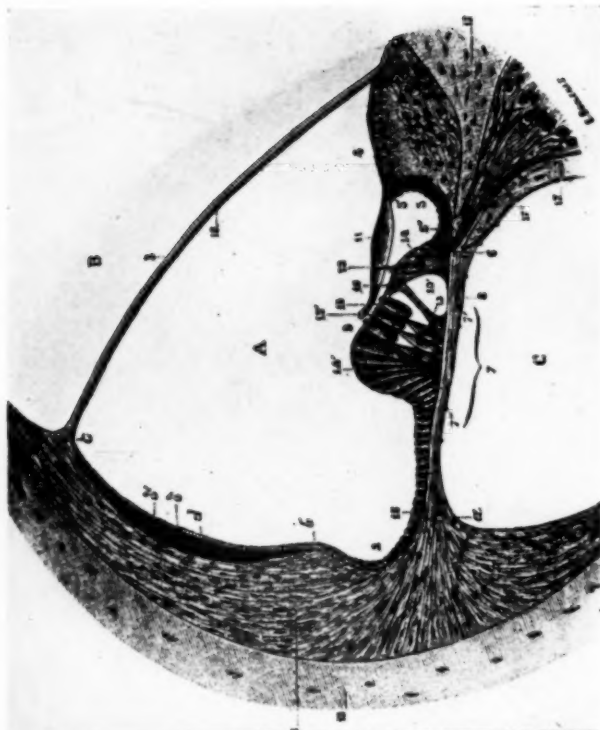


Fig. 5 B

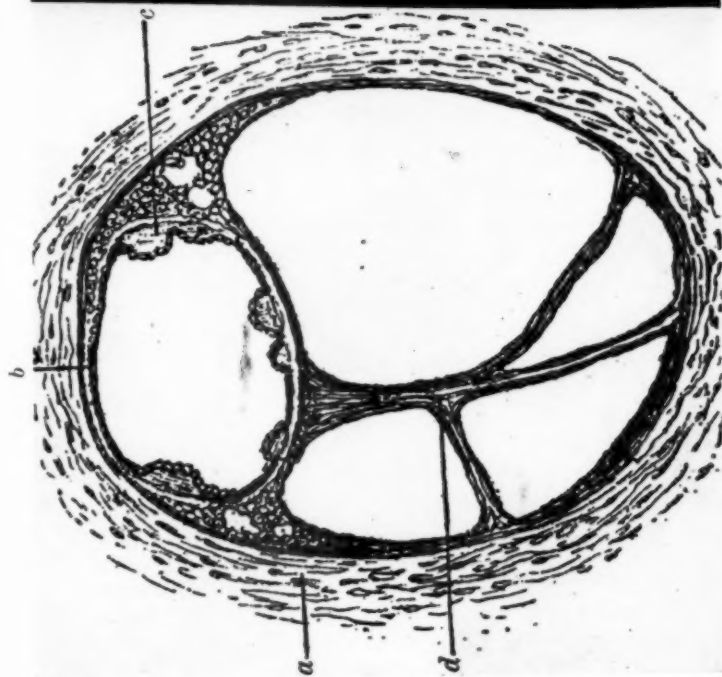


Fig. 6 A

Fig. 6 A (Walker). Section of the osseous and membranous semicircular canals. *a*, Osseous semicircular canal; *b*, place of attachment of the membranous semicircular canal; *c*, globular elevations on the inner surface of the membranous semicircular canal; *d*, vascular connective-tissue bands (Politzer).



Fig. 6 B

Fig. 6 B (Walker). Structure of the substance analogous to vitreous in which the otolith crystals are embedded. Under dark-ground illumination (Tenaglia).

the choroid are like those of the cochlea as regards the presence of anastomoses both within and without their drainage territory. They resemble those of the cochlea also in the double exit from the limiting walls of this territory and in their final external drainage in

marked in the ganglionic region, and is also noticeable in the auditory canal. Not only this but interweaving of the fibers takes place so that cross-sections for tracing bundle or quadrant defects are not so valuable in the auditory nerve as in the optic nerve and there-

fore are not so often displayed. Considering the orderly fashion in which the optic nerve is arranged one wonders how the auditory nerve maintains any system in sound reports. Certainly such meshing could never be tolerated in the telephone switch-board.

Normally the glia extends farther toward the percipient elements in the auditory than in the optic nerve. The auditory will average 18 mm. in length and the

glia extends to within 6 mm. of the macula. These measurements are 2 to 4 mm. shorter in women than in men. The extension is farther out the vestibular portion of the auditory nerve. The glia extends only to the disc in the optic nerve.

The fibers of both nerves are medullated. The medullation of the optic nerve is lost at the lamina cribrosa, but that of the auditory nerve persists through the bony cribriformis, corresponding to the membranous macula, and stops at the habenula perforata in the cochlea and at the basement membrane of the macula of the vestibular portion. Although these labyrinthine entrances seem more fortified by both bony and fibrous gateways, where the lamina cribrosa is only fibrous, nevertheless the arachnoid follows along the nerve loosely enough so that cerebral pressure may be delivered nearer to the nerve endings in the labyrinth than in the bulbus. The myelin sheath of the auditory nerve is segmented and grows each way from the bipolar ganglion cells, as do the nerve fibers, whereas the myelin sheath of the optic nerve grows down (unsegmented) from the



Fig. 7 A (Walker), Schlemm's canal (Leber). 1, 1', Canal with anastomoses and plexuses. 2, 2, 2, Veins of the ciliary muscles emptying into the canal and on the other side anastomosing with—3, The episcleral venous network, 4, Venous network on the brim of the cornea, which continues in front of Schlemm's canal, with episcleral net.

either of two large channels. Nevertheless these venous returns are unlike in that the venæ vestibuli on leaving the labyrinth are in no wise subjected to intracranial pressure while the auditory and cochlear vein may receive a severe lateral pressure from the arachnoid, which is, however, not comparable with the entrapment of the ophthalmic vein. This may be helpful in considering the fact that hemorrhage, diapedesis, and the like, are often found in the cochlea and retina, but never in the choroid, when increased intracranial pressure exists. Valves are absent throughout the venous system of both the eye and the ear.

V. Nerves. If the arrangement of optic nerve fibers—by which they entered the eyeball in separate bundles as first described in certain vertebrates by Jan Deyl²⁰—had persisted in humans the optic nerve might be more like the auditory nerve than it is at present. Now we find it most unlike in the matter of anastomosis and bundle arrangement. The anastomotic tendency is greatest in the cochlear division (Fig. 5, A) beginning almost as the fibers leave the percipient elements; is

brain after the nerve fiber has grown up from the unipolar retinal ganglion cells.

VI. The analogy of the saccus endolymphaticus to Schlemm's canal (Fig. 7). When it was noted by comparing measurements that the circumference of the saccus endolymphaticus, the average diameter of which is 12 mm., was practically equal to that of Schlemm's canal, and that both drained more or less peripherally through numerous special exit devices⁴³ into venous channels^{45, 79}, it became interesting to study the extent to which the analogy could be carried.

The anterior chamber of the eye and the endolymph canals of the labyrinth, may be considered as closed cavities draining through such peripheries as have just been described and obtaining their supply of fluid to a large extent from a vascular area which may be considered the ciliary body in the eye and the stria vascularis in the cochlear canal (scala media) of the membranous labyrinth. If the length of this stria be taken as about 30 mm. it is seen to be almost as long as the circumferential measurements of the ciliary processes without accounting for the folds of these processes. Although the volume of the two chambers might be very similar, yet it seems quite certain that the rate of flow is greater in the anterior chamber of the eye—one cubic millimeter per minute. This is reasonable in view of the greater vascularization and productive area of the ciliary body. Further, the portals of exit are less extensive for the saccus, being more toward the neck of the pars intermedia of the sac at least, according to Guild⁴⁶, in the case of the guinea pig. Not only does the drainage area in the saccus appear to be less extensive, but a membrane of columnar epithelium without a basement layer, having the drainage ability of arachnoid villi, is interposed before the endolymph reaches the surrounding copious venous system, whereas in Schlemm's canal the connection is quite direct by capillary anastomosis with the ciliary venous system although membranes still

more definitely of the character of arachnoid villi are found in the pectinate ligament, called pectinate villi by Weed and Wegefarth^{98, 103}. Thus the circulation of aqueous in the eye, of endolymph in the ear, and of the sub-arachnoid ventricular fluid in the brain

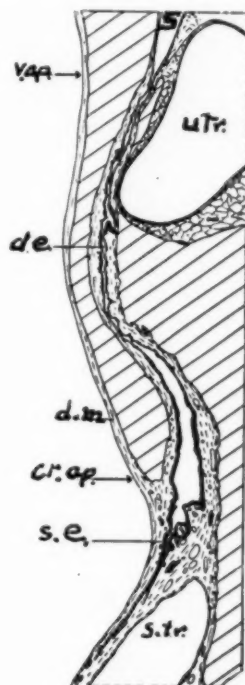


Fig. 7 B (Walker). Section of the lumen of the ductus endolymphaticus (Guinea-pig). *cr. ap.*, *v. ap.*, The arrows indicate, respectively, the cranial (or external) and the vestibular (or internal) apertures of the osseous aqueductus vestibuli, bone being shown by oblique hatching, as in the other figures: *d.e.*, Ductus endolymphaticus; *d.m.*, dura mater; *s.*, saccus; *s.e.*, saccus endolymphaticus; *s. tr.*, transverse dural venous sinus; *trab.*, the trabeculated superior part of the vestibule; *utr.*, utricle (Guild).

all seem to be subject to an analogous mechanism of nature. In this respect they fit well into the general system of control of fluids in body cavities as taught by Weed though only published in part as yet*.

Some difference seems to be present, due to the fact that the anterior chamber is lined with endothelium while the

* Personal communication.

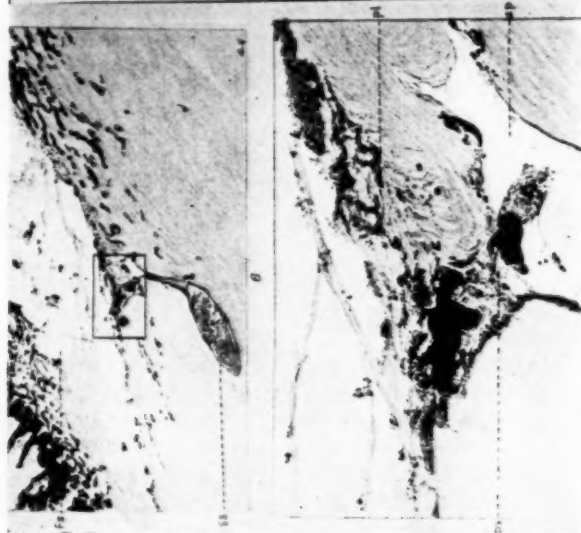


Fig. 8 A

Fig. 8 A (Walker). Upper part: Posterior chamber injection. Filtration limited to one point along scleral surface. Direct communication between large sinus and branch of anterior ciliary plexus (Schlemm's canal). *ir*, Iris. *f.s.*, Fontana space. *s.s.*, Scleral sinus. Lower part: High power at point of drainage to show continuity of column of pigment-granules between angle and plexus. The specimen was counterstained with eosin alone, but even here the protrusion of the pectinate tissue into the sinus can readily be seen. *p.l.*, Pectinate ligament. *a.p.*, Anterior ciliary plexus. *p.v.*, Pectinate villus (Wegefarth).

Fig. 8 B (Walker). A non-vascularized epithelial process (*n-v.pr.*) cut through its long axis, as well as typical wall and contents of the columnar epithelial region of the sacculus. *n-v.pr.*, Non-vascularized epithelial process. *endol.cl.*, Cells and debris in the lumen of saccus endolymphaticus. *ep.*, Epithelium. *cl.*, Connective tissue. *b.v.*, Blood-vessel (Guild).



Fig. 8 B

membranous labyrinth is lined with epithelium, yet Guild shows endothelial cells in the avascular villi found in the saccus. Perhaps these cells are derived from the venous sinus lining, into which they drain. Clearly the analogy is sufficient to allow one to speculate on the possibilities of trephining the saccus in case its drainage mechanism should become blocked and thereby produce a hypertension, analogous to glaucoma, within the membranous labyrinth. As a matter of fact the saccus has been surgically drained (Portmann⁷³) several times in efforts to control persistent tinnitus, which it was believed might be due to hypertonus in the endolymphatic chambers. The great handicap of the otologist so far has been the inability actually to measure the pressure and rate of flow in the aural chambers in the way the ophthalmologist does so easily in the chambers of the eye. But it seems certain since the way has been shown in Guild's work that data on these points should soon appear.

Further it may be inferred by analogy that both eye and ear have, to a certain extent, a pumping mechanism. Thus if the scleral spur, being frequently pulled upon by the longitudinal fibers of the ciliary muscle provides a flow outward from Schlemm's canal and the pectinate villi, then it might appear that pulsation of cerebral tissues against the saccus with each heart beat could perform a similar function for the endolymph system. The long (6 mm.) capillary tube (0.25 mm. diameter) of the ductus endolymphaticus, plus the pars intermedialis of the saccus is analogous in function to the tortuous canals of the pectinate ligament and Schlemm's canal. At least it would have to have a capacity roughly of only one twenty-fifth that of the anterior chamber, which is 1 cubic millimeter per minute (Jonas Freidenwald, *Trans. Am. Ophth. Soc.* 1931, v. 29.) to be analogous on a basis of the larger blood supply to the eye.

The drainage mechanism of the anterior chamber however seems much coarser than that of the saccus which

apparently has some of the characteristics of a semipermeable membrane. In the dog, Weed and Wegefarrth have described mechanisms in the drainage apparatus of the anterior chamber (Fig. 8, A) which have the characteristics of arachnoid villi yet much more definitely than in the monkey. In the same way that closure of Schlemm's canal or the drainage angle of the eye can produce hypertony in the eye, so closure or obstruction of the ductus or saccus endolymphaticus can produce signs of pressure in the endolymphatic chambers of the ear, as indicated by dilatation of the canals, as has been noted by Guild⁴⁶ in the guinea pig, and by Fraser⁵⁵ in a man, aged 23 years, with congenital lues and deafness. Incidentally it may be noted also that the work of Rüdinger cited in many textbooks as having demonstrated the presence of fine channels leading from the periphery of the distal portion of saccus into the dural lymph channels has not been confirmed by Guild⁴⁵, by Sterzi⁹², nor by Siebenmann⁵⁵.

The ductus endolymphaticus (Fig. 4) receives a right angled, rather than a Y, connection from the utricle as it proceeds to the saccule. The saccule is connected with the cochlear canal (scala media) by another narrow canal, the ductus reuniens, and on this account since the narrow—one-eighth mm.—arm of the right angled branch going to the utricle is very short—one mm.—it might be expected that pressure changes between the saccus and the utricle and the semicircular canals would be less prompt than between the saccus and the cochlea. However this may not entirely account for the fact that hemorrhage is more common in the cochlea, not only during the unrelieved pressure of brain tumor, but also immediately after decompression operations. Probably the reason for this is that the vessels are better protected by trabecular fibrous tissue in the posterior canal of the labyrinth.

VII. The ductus cochlearis is a direct by-pass 9 mm. long and one-fourth mm. in diameter connecting the chamber of the scala tympani, and therefore

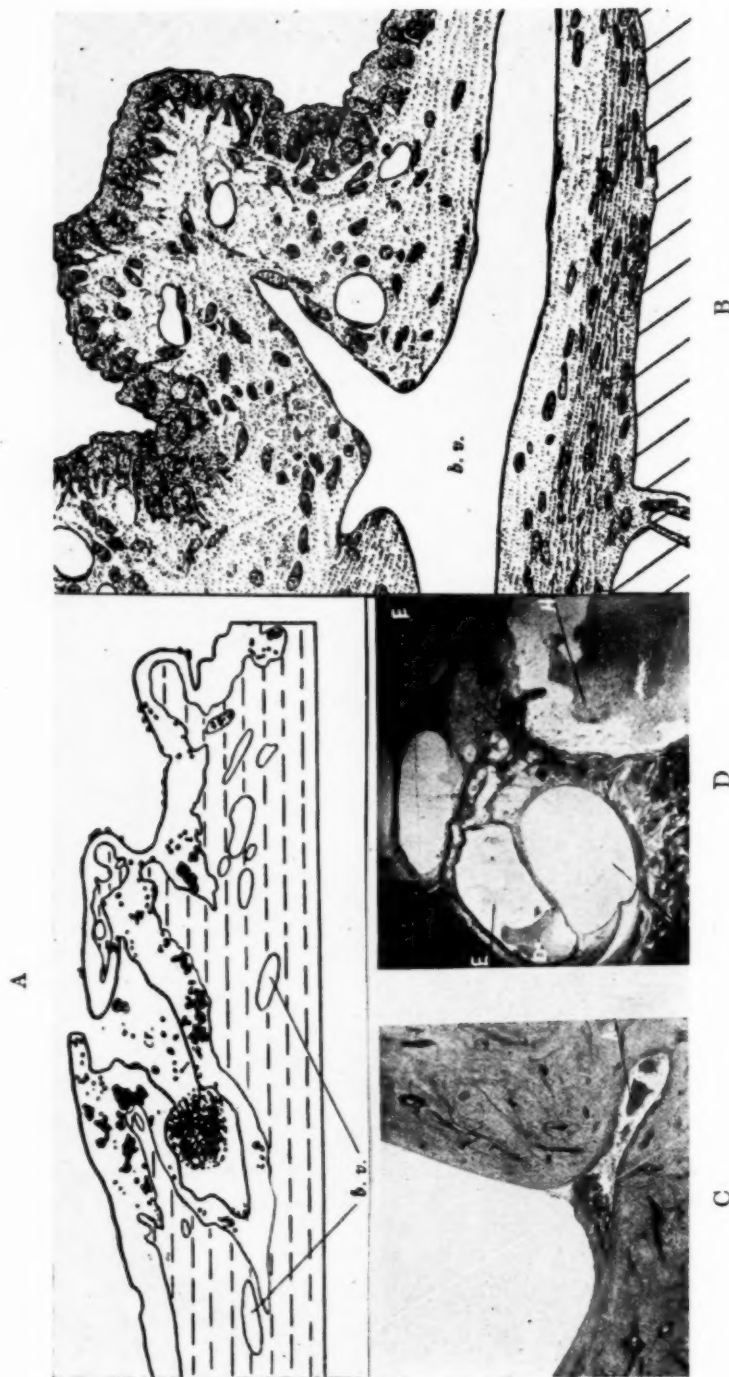


Fig. 9—A. Outline sketch of part of wall of pars intermedia of the saccus endolymphaticus—after a 1 percent solution of equal parts of potassium ferrocyanid and iron-ammonium citrate had been injected into the ductus cochlearis, fixation by 10 percent formalin plus 1 percent HCl. In order to permit the Prussian-blue precipitate to be demonstrated in the sketch without the use of a colored illustration, the epithelium and connective tissue have been shown in outline only. *ep.*, Epithelium, in outline. *c. l.*, Connective tissue, shown with horizontal hatching. *b. v.*, Two of several small blood-vessels in sketch. *cr.*, A crypt of the saccus. All solid black dots and masses represent the ferric ferrocyanid present (Guild).
 B. Typical region of the wall of the part of the saccus endolymphaticus in which columnar epithelium is present (pars intermedia of the saccus endolymphaticus proprius of the suggested terminology), *b. v.*, Longitudinally cut blood-vessel; this vein empties into the transverse sinus. The lumina of this and the other blood-vessels are empty because of the vascular injection of the fixation fluid (Guild).
 C. Tumor of the upper region of the parietal lobe. Not operated upon. Choked labyrinth. Blood and exudate in the cochlear aqueduct, *A. c.*
 D. Tumor of the middle fossa. Not operated upon. Choked labyrinth. Hemorrhage in the internal auditory meatus, *H*—; exudate in the scallae, *E. E. E.*; and in the cochlear canal (Alexander).

the entire perilymph chamber surrounding the endolymph canal, with the subarachnoid space (Fig. 4). In this respect there is only the weakest analogy in the eye. That is to say that the connection of the subchoroidal space of the eye with subarachnoid chamber of the sheath of Schwalbe is of such microscopic dimensions as to have been a matter of argument. Certainly from a pressure standpoint the percipient elements of the eye are better protected from cerebral pressure by this route than in the case of the ear where the subarachnoid fluid and pressure can be effective almost, if not quite, to the terminal elements. Because of this weakness the necessity for the fluid counter pressure obtainable from a by-pass possibly accounts for the ductus cochlearis in much the same way that the Eustachian tube equalizes air pressure on the membrana tympani. However there is this difference, the counter pressure in the labyrinth has to be accomplished partly through the intermediation of the flexible Reisner's membrane in balance with the sacculus endolymphaticus, its drainage exits, and fluid additions from the stria vascularis. Thus the total result may be an increase of pressure both inside and outside the membranous labyrinth practically equal to that of the intracranial pressure. Thus as far as the increase of pressure alone is concerned we have an analogy with glaucoma more than with ocular choked disc since the latter does not increase the pressure within the eyeball, although, as Parker⁶⁸ has shown, the low pressure eye is first affected by intracranial pressure.

Nevertheless hemorrhages, exudates, and venous congestion occur in the cochlea³, as in choked disc, under the same condition of increased intracranial pressure³; therefore the increased labyrinthine pressure is still unable to balance the congestion produced by lateral (not choking) pressure on the thin-walled auditory vein. On the other hand, although there is increased pressure and nerve atrophy on that account in the ear, yet there is not the cupped disc effect in the ear because there is no

flexible lamina cribrosa but rather a multitude of rigid bony sieves, the zonula perforata, and the like, which will not exactly permit the stretching of nerve fibers and strangulation of nutrition as occur in glaucoma simplex. Furthermore the function of the labyrinth must be impaired less than that of the eye under increased pressure. Crowe and Dandy have concluded after examining the records of 500 brain tumor cases that no disturbance of hearing occurred no matter how high the intracranial pressure, unless the auditory pathways themselves were encroached upon. The very large tumors which occur in the chiasmal and frontal region offer the clearest demonstration of this phenomenon.

Conclusions

Altogether it seems that the labyrinthine condition in cerebral pressure does resemble the conditions of both glaucoma and choked disc to a certain extent, but not enough to take the name of either without giving a wrong impression. It really justifies a new name just as glaucoma and choked disc did in the first place. For the present a descriptive term, such as "hydro-congestive labyrinth", or "otic hydro-congestion", would be more definite than "choked labyrinth". The "hydro" element indicating the increase of fluid pressure as in intracranial pressure while the "congestive" indicates that part of the congestive phenomena of "choked disc" that may be present. Then again "endolymph-hydrops", or simply "otic-hydrops", would be a better term to use than "glaucoma of the ear" in describing the condition of insufficient drainage from the aural endolymphatic system.

Symptomatically there is a certain similarity in the early stages of congestive hydro-labyrinth, glaucoma simplex, and choked disc, provided one takes away from the ophthalmologist, his tonometer, perimeter, and ophthalmoscope.* Then, just as the otologist

* Thereby reducing the ophthalmologist to the state of the otologist who is fully conscious of those differences and is turn-

might detect no defect in hearing or equilibrium in ordinary tests, so might the simple central visual tests fail to show appreciable lowering of vision in choked disc or simple glaucoma for many months, perhaps in some cases, even for years.

At least it seems certain that the pressure in the otic perilymph must increase as the subarachnoid pressure increases (Fig. 4A) if the cochlear duct is patent, since the supply of cerebrospinal fluid is so great that no otic drainage would be sufficient to carry off the large amount necessary to keep the labyrinthine pressure normal. This increased pressure in the perilymph canals would tend to depress Reisner's membrane (Fig. 5B), even rupture it, unless the pressure in the endolymph canal was also raised. Pressure in the endolymph canal could be raised by pressure of the brain against the sacculus endolymphaticus, thereby sufficiently reducing its drainage until the difference in the pressure could be borne by Reisner's membrane. In the absence of definite experimental knowledge of the pressures in these canals it would seem that the frequent finding of hemorrhage in the cochlea after cranial decompression is significant. This can be explained by the sudden release of these hydrostatic pressures through both ductus endolymphaticus and ductus cochlearis leaving the congested surface capillaries of the membranous cochlea insufficiently supported. Vibration due to operation on the

ing for study to animals having somewhat transparent, almost skin deep, large labyrinth not bony encased, as, e.g., the hammer-headed shark.¹⁰⁰

skull and blood pressure elevated by anesthetic would aid also, in starting such bleeding. The same thing happens in decompressing high tension eyes, perhaps to a less extent, because of the greater use of vaso-constricting drugs. Thus the hydro-congestive labyrinth of cerebral hypertension has some, but not all, of the features of both choked disc and glaucoma.

Glaucoma of the type due to insufficient drainage into the canal of Schlemm has a more direct analogue in the "otic-hydrops", of the endolymph chambers due to insufficient saccus drainage. To what extent this condition in the ear may account for such a syndrome as Ménière's disease is uncertain, but it seems certain to me that it occurs almost as frequently as the analogous condition in the eye and it probably accounts for more distorted hearing and imperfect equilibrium, than we are now able clearly to differentiate.

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References

- ¹ Adler, F. H. Ocular disorders in deficiency diseases. *Arch. of Ophth.*, 1927, v. 56, p. 593.
- ² Alexander, Gustav. Zur Histologie der Mittelohrschleimhaut. *Monatschr. f. Ohrenh. u. Rhino-Laryngol.*, 1927, v. 61, p. 446.
- ³ ———. Choked labyrinth in brain tumor. *Surg., Gynec. and Obst.*, 1928, v. 46, p. 361.
- ⁴ ———. Die nichteitrigen Erkrankungen des inneren Ohres. *Innenohraffektion und Allgemeinerkrankung. Handbuch d. Hals-, Nasen u. Ohrenh.*, Herausg. v. A. Denker u. O. Kahler, Berlin, Julius Springer; München. J. F. Bergmann, 1926.
- ⁵ ———. Ueber neurotischen Labyrinthschwindel. *Monatschr. f. Ohrenh. u. Rhino-Laryngol.*, 1918, v. 52, p. 161.
- ⁶ ———. Zur Frage der phylogenetischen, vikariierenden Ausbildungen der Sinnesorgane. *Zeit. f. Psychol. u. Physiol. d. Sinnesorg.*, 1905, v. 38, p. 24.
- ⁷ ———. Bau und Function des perilymphatischen Gewebes im innern Ohr des Menschen und der höheren Säugetiere. *Arch. Néerl. d. Physiol.*, 1922, v. 7, p. 552.

- ⁴ Alexander and Marborough. Handbuch d. Neurologie d. Ohres. Urban and Schwarzenburg, Berlin, 1928.
- ⁵ Alt, F. Ueber den Einfluss des gesteigerten intracraniellen Druckes auf den Schallempfindenden Apparat. Monatschr. f. Ohrenh., 1898, v. 32, p. 97.
- ⁶ Beaver. Notes on the connection between diseases of the eyes and the diseases of other organs. Lehigh Valley Magazine, Easton, Pa., 1893, v. 5, p. 134.
- ⁷ Benesi, O. Hypernephrom des Gehörorgans. Monatschr. f. Ohrenh. u. Laryngo-Rhinol., 1920, v. 54, p. 961.
- ⁸ Benjamins, C. E. (Groningen)—The exact determination of acuity of hearing. Internat. Zentralbl. f. Ohrenh. u. Rhino-Laryng., 1930, July.
- ⁹ Boettcher, Arthur. Kritische Bemerkungen und neue Beiträge zur Literatur des Gehör-labyrinthes. W. Glaser's Verlag, 1872.
- ¹⁰ Brunner, H. Atypische Ohrbefunde bei Tumoren des Kleinhirnbrückenwinkels. Monatschr. f. Ohrenh., 1927.
- ¹¹ Bruns. Die Geschwulste des Nervensystems. Berlin, 1908.
- ¹² Camis and Creed. The physiology of the vestibular apparatus. Clarendon Press, Oxford, 1930.
- ¹³ Cannieu. Sur l'insertion de la membrane de Corti. Compt. Rend., v. 119, No. 2.
- ¹⁴ Cunningham, D. J. Text-Book of Anatomy. Macmillan Co., New York, 1902.
- ¹⁵ Cushing, Harvey. Concerning a definite regulatory mechanism of the vasomotor center which controls blood pressure during cerebral compression. Bull. Johns Hopkins Hosp., 1901, Sept., p. 290.
- ¹⁶ ———. The blood pressure reaction of acute cerebral compression, illustrated by cases of intracranial hemorrhage. Amer. Jour. Med. Sc., v. 125, p. 1017.
- ¹⁷ ———. Studies on the cerebro-spinal fluid. I. Introduction. Jour. Med. Research, 1914, v. 26, p. 1.
- ¹⁸ de Juan, P. Some other observations on Ewald's law, and on the plane of the nystagmus obtained by compression and aspiration. Acta Oto-Laryngol., v. 14, part 1-2.
- ¹⁹ De Kleyn, A. and Versteegh, C. Some remarks upon the present position of the physiology of the labyrinth. Jour. Laryng. and Otol., 1927, v. 42, p. 649.
- ²⁰ Denker and Kahler. Handbuch d. Hals-, Nasen- u. Ohren., Berlin, Julius Springer, 1927.
- ²¹ Deyl, Jan. Diseases of the optic nerve. Norris and Oliver, 1898, v. 3, p. 579.
- ²² ———. Cancer of the eye and its neighboring organs. Now. lek. Poznan., 1904, v. 16, p. 194.
- ²³ ———. Ueber den Eintritt der Arteria centralis retinae in den Sehnerv beim Menschen. Anat. Anz., Jena, 1895-6, v. 11, pp. 687-692. Also časopis. lék česk., v. Prazě, 1896, 1892, v. 35, p. 81. (Army Medical Library.)
- ²⁴ ———. Oftalmoskopické nálezky u severomorských ryh (North sea fish) Rozpr. české acad. cis. Frantiska Josefa, et cetera, v. Prazě, 1897, v. 7, no. 14, pp. 1-9.
- ²⁵ ———. Ueber den Sehnerven bei Siluroiden und Acanthropsiden. Anat. Anz., Jena, 1895, v. 11, pp. 8-16.
- ²⁶ Drury, Dana. Acoustic lacunæ. Laryngoscope, 1925, v. 35, p. 1.
- ²⁷ Ferree and Rand. Methods for the detection of scotomas. Arch. of Ophth., 1931, v. 5, p. 225.
- ²⁸ Fischer, J. Studien zur pathologischen Anatomie des Schläfenbeines. Monatschr. f. Ohrenh. u. Rhino-Laryngol., 1925, v. 59, p. 877.
- ²⁹ Flechsig. Die Leitungsbahnen im Gehirn und Rückenmark des Menschen auf Grund entwicklungsgeschichtlicher Untersuchungen, Leipzig, W. Engelmann, 1876, v. 16, p. 382.
- ³⁰ Fraser, J. S. Maldevelopments of the auricle, external acoustic meatus and middle ear. Arch. Oto-Laryng., 1931, v. 13, p. 2.
- ³¹ ———. The pathology of deaf-mutism. Laryngoscope, 1923, v. 33, p. 721.
- ³² Gerstmann, T. Studien für Symptomatologie der Hirnerkrankungen. Wien. klin. Woch., 1927, p. 1133.
- ³³ Gildemister. Probleme und Ergebnisse der neueren Akustik. Zeit. f. Hals-, Nasen- u. Ohrenh., Berlin, 1930, v. 27, p. 290.
- ³⁴ Gladkov, A. Ueber Pupillenreflexe und Schallreize. Z. usn. Bol., 1929, v. 6, p. 636.
- ³⁵ Grahe. Die Bedeutung der Ohrenuntersuchung für die Hirndiagnostik. Centralbl. f. Hals-, Nasen- u. Ohrenh., 1924, v. 5, p. 289.
- ³⁶ Grashey, H. Experimentelle Beiträge zur Lehre von der Blutcirculation in der Schädel-rückgratshöhle. Festschrift., München, 1892, v. 4, p. 1.
- ³⁷ Gray. Labyrinth of animals, 1907, J. and A. Churchill, London, v. 1, p. 27.
- ³⁸ ———. Anatomy of the human body, Lea and Febiger, Phila., 21st edition, 1924.
- ³⁹ Guild, S. R. Experimental evidence on the circulation of the endolymph in mammals. Anat. Rec., 1924, v. 27, p. 205.
- ⁴⁰ ———. War deafness and its prevention. Report of the labyrinths of the animal used. Jour. Lab. and Clin. Med., 1919, v. 4, p. 153.
- ⁴¹ ———. The circulation of the endolymph. Amer. Jour. Anat., 1927, v. 39, p. 57.
- ⁴² ———. Observations upon the structure and normal contents of the ductus and saccus endolymphaticus in the guinea-pig (*Cavia cobaya*). Amer. Jour. Anat., 1927, v. 39, p. 1.

- ⁴¹ Habermann. Die Veränderungen im inneren Ohr bei Stauungspapille. Zeit. f. Ohrenh., 1917, v. 75, p. 19.
- ⁴² Hamburger, Carl. Theoretical and practical notes on glaucoma. Amer. Jour. Ophth., 1930, v. 13, p. 831.
- ⁴³ Henke and Lubarsch. Handbuch des spec. Path. Anat. u. Hist., Wittmaack, v. 12.
- ⁴⁴ Hoff, Hans. Beiträge zur Relation der Sehphäre und des vestibularapparat Zeit. f. Neurol., 1929, v. 121, p. 751.
- ⁴⁵ Horsley. The experimental investigation in the arrangement of the fibers of the internal capsule of the Bonnet monkey. Trans. Royal Soc., London, 1890.
- ⁴⁶ Karlefors. Die Hirnhauträume des Kleinhirns. Die Verbindungen des vierten Ventrikels mit den Subarachnoidalräumen und der Aqueductus Cochleæ beim Menschen. Acta. Oto-Laryng. Suppl., 1924, v. 4.
- ⁴⁷ Katz. Histologisches über den Schneckenkanal, spec. die Striavascularis, Verhandl. d. 10th Internat. Congress, Berlin, 1900.
- ⁴⁸ Knapp, Herman. On the combined occurrence of affectations of sight and hearing. Arch. of Ophth. and Otol., 1878, v. 3, p. 173.
- ⁴⁹ Kobrak, F. Zur Frage einer exakten Messbarkeit der Sensibilität des Vestibularapparats. Arch. f. Ohrenh., 1919-1920, v. 105, p. 132.
- ⁵⁰ Kolmer, Handbuch der microscopischen Anatomie des Menschen. Wilhelm v. Mollendorff, 1928, v. 3, 1st pt.
- ⁵¹ Kompanejetz. Zur Frage über die Ursache der Schwerhörigkeit bei blauen Skleren und Knochenbruchigkeit. Monatschr. f. Ohrenh., 1930, v. 64, p. 193.
- ⁵² Kravkov. Ueber die Abhängigkeit der Sehscharfe vom Schallreiz. Graefe's Arch. f. Ophth., 1930, v. 124, p. 335.
- ⁵³ Lasareff. Ueber den gegenseitigen Einfluss der Gesicht- und Gehörorgane. Bull. de l'acad. sc. de Rusoie, 1918, p. 1297.
- ⁵⁴ Lewis, Royal. Chiasmal symptoms in intracranial tumors. Trans. Amer. Med. Assoc., Sec. on Ophth., 1931, June.
- ⁵⁵ Magitot, A. Aqueous Humor in Glaucoma. Arch. Ophth., 1931, v. 6, No. 5, p. 647.
- ⁵⁶ Maxwell, S. S. Labyrinth and equilibrium. Phila. and London, 1923.
- ⁵⁷ Meltzer, Philip E. Gradenigo's syndrome. Arch. Otolaryng., 1931, v. 13, p. 87.
- ⁵⁸ M'Nally, W. J. Lectures on physiology of ear, 1930, v. 89, p. 248.
- ⁵⁹ Mendoza, Rafael. Ocular strabismus and the absence of auditory strabismus. Rev. españ. y Americana de laringol., 1930, June, p. 251.
- ⁶⁰ Moos. Zur Genese der Gehstörungen bei Gehirntumoren. Berl. klin. Woch., 1884, v. 21, p. 713.
- Ueber das kombinierte Vorkommen von Störungen im Seh- und Gehörorgan. Arch. of Ophth. and Otol., 1878, v. 3, p. 173.
- ⁶¹ — Beziehungen der Mikroorganismen zu den Mittelohrerkrankungen und deren Complicationen. Verhandl. d. Internat. med. Congress, Berlin, 1891.
- ⁶² Morris. Human anatomy. P. Blakiston's Son Co., Philadelphia, 1893.
- ⁶³ Parker, W. R. The relation of choked disc to the tension of the eyeball. Jour. Amer. Med. Assn., 1916, v. 67, p. 1053.
- ⁶⁴ — The mechanism of papilledema. Arch. Neurol. and Psychiat., 1925, v. 14, p. 31.
- ⁶⁵ Piersol. Anatomy. J. B. Lippincott Co., Philadelphia. 9th edition, 1930, pp. 1436-1526.
- ⁶⁶ Politzer. Diseases of the ear. Lea Brothers, Philadelphia. 4th edition, 1922.
- ⁶⁷ — Ueber Anastomosen zwischen den Gefässbezirken des Mittelohrs und des Labyrinths. Arch. f. Ohrenh., 1874, v. 11.
- ⁶⁸ — Labyrinthebefunde bei chronischen Mittelohreiterungen. Arch. f. Ohrenh., 1905, v. 65, p. 161.
- ⁶⁹ Porter, Allen D. Postdiphtheritic paralysis. Ann. of Oto-Laryng., 1930, v. 39, p. 193.
- ⁷⁰ Portmann, G. The saccus endolymphaticus and an operation for draining for the relief of vertigo. Proc. Royal Soc. Med., London, 1927, v. 20, p. 1862.
- ⁷¹ Pritchard, Urban. The termination of the nerves of the vestibule and semicircular canals. Quart. Jour. Med. Sc., 1876.
- ⁷² Riley, H. A. The central nervous system control of the ocular movements and the disturbances of this mechanism. Arch. of Ophth., 1930, v. 4, pp. 640 and 885.
- ⁷³ Rudinger, Nicolaus. Ueber die Verbreitung des Sympathicus in der Animal. Rohre des Rückenmarks. J. J. Lentner. München, 1863.
- ⁷⁴ — Ueber die Abflusskanäle der Endolymphe des inneren Ohres. München, 1888. Army Med. Library, reprint from, Sitz. d. meth.-phys. Cl. d. k. bayer. Akad. d. Wiss., 1887.
- ⁷⁵ — Beiträge zur Anatomie d. Gehörorganes der venosen Blutbahnen der Schädelhöhle sowie der überzähligen Finger. München, 1876.
- ⁷⁶ — Cursus der topographischen Anatomie. München, J. F. Lehmann, 4th edition, 1899.
- ⁷⁷ Rumjanzewa, A. F. Pappilledema and intraocular tension. Zeit. f. Augenh., 1930, v. 72, p. 391.
- ⁷⁸ Ryder, J. A. Development of the eye. Norris and Oliver, 1897, v. 1, p. 1.

- ⁸⁴ Sherrington. Reciprocal innervation of antagonistic muscles. Trans. Royal Soc. London, 1898, p. 190.
- ⁸⁵ Siebenmann, F. Anatomische Untersuchungen über den Saccus und Ductus endolymphaticus beim Menschen. Passow's Beitr. z. Anat., u.s.w. d. Ohres, 1919, v. 13, p. 54.
- ⁸⁶ ———. Infection der Knochenkanäle. Zeit. f. Ohrenh., 1899, v. 29.
- ⁸⁷ ———. Ueber die zentralen Hörbahn und über ihre Schädigung durch Geschwülste des Mittelhirns speziell der Vierhügelgegend und der Haube. Zeit. f. Ohrenh., 1896, v. 29, p. 28.
- ⁸⁸ Somberg, J. S. Optic nerve pallor without functional disturbances in luetics. Amer. Jour. Ophth., 1927, v. 10, p. 837.
- ⁸⁹ Sorsby, Arnold. Latent nystagmus. Brit. Jour. Ophth., 1931, v. 15, p. 1.
- ⁹⁰ Spalteholz. Hand-atlas of human anatomy. J. B. Lippincott and Co., 1900.
- ⁹¹ Stenvers, H. W. Ueber Kopfhaltung bei Gehirntumor oberhalb und unterhalb des Tentoriums. Psychiat. u. Neurol., Amsterdam, 1924, v. 6, p. 227.
- ⁹² Sterzi, G. Il sacco endolinfatico: Ricerche anatomiche ed embriologiche. Morph. Jahrb., 1909, v. 39, p. 446.
- ⁹³ Testut, L. Traité d'anatomie humaine. Octave Doin et Fils, Paris, 6th edition, 1911.
- ⁹⁴ Toldt, Carl. Atlas of human anatomy. Macmillan Co., New York, 2nd edition, 1928.
- ⁹⁵ Urbantschitsch. Ueber den Einfluss einer Sinneserregung auf die übrigen sinnesempfindungen. Pflüger's Arch. f. d. ges. Physiol., 1880, v. 42, p. 155.
- ⁹⁶ Veronese, F. Influenza di un'otite chronica sullo stato della pupilla. Riv. Veneta di sc. med. Venezia, 1888, v. 9, p. 322.
- ⁹⁷ Von Stein. a) Die Lehre von Funktion des Labyrinthes, Jena, 1847.
b) Der Schwindel, Universitätsklinik Moskau, 1910.
c) Auge und Ohr von Martin Bartels im kurzes Handbuch d. Ophthalmologie, Schieck and Bruckner, 1931, v. 3, p. 725.
- ⁹⁸ Weed, Lewis H. Studies on the cerebro-spinal fluid. II. The theories of drainage of cerebro-spinal fluid with an analysis of the methods of investigation. Jour. Med. Research, 1914, v. 26, p. 21.
- ⁹⁹ ———. Studies on cerebro-spinal fluid. III. The pathways of escape from the subarachnoid spaces with particular reference to the arachnoid villi. Jour. Med. Research, 1914, v. 26, p. 51.
- ¹⁰⁰ ———. Studies on cerebro-spinal fluid. IV. The dual source of cerebro-spinal fluid. Jour. Med. Research, 1914, v. 26, p. 93.
- ¹⁰¹ Wegfarth, Paul. Studies on cerebro-spinal fluid. V. The drainage of intraocular fluids. Jour. Med. Research, 1914, v. 26, p. 119.
- ¹⁰² ———. Studies on cerebro-spinal fluid. VI. The establishment of drainage of intraocular and intracranial fluids into the venous system. Jour. Med. Research, 1914, v. 26, p. 149.
- ¹⁰³ Wegfarth and Weed. Studies on cerebro-spinal fluid. VII. The analogous processes of the cerebral and ocular fluids. Jour. Med. Research, 1914, v. 26, p. 167.
- ¹⁰⁴ Werner, C. F. The Labyrinth. Ann. Otol. Rhin. and Laryng., 1930, v. 39, p. 104.
- ¹⁰⁵ ———. Das Labyrinth als hydrostatisches Organ und die Funktion des offenen Ductus endolymphaticus bei Fischen. Zeit. f. Hals-, Nasen- u. Ohrenh., 1930, v. 26, p. 445.
- ¹⁰⁶ Wilkinson, George. Some mechanical problems in making cochlear models. Jour. Laryng. and Otol., 1930, v. 45, p. 833.
- ¹⁰⁷ Wilmer, W. H. Relations of the vascular system to certain ocular diseases. Wash. Med. Ann., 1912, v. 11, p. 253.
- ¹⁰⁸ Wittmaack. Experimentelle Studien über die Beziehungen der Liquorsekretion und der Liquorzusammensetzung zu einigen Erkrankungen des inneren Ohres. Klin. Beitr. z. Ohrenh., Festschr. f. Urbantschitsch, 1919.
- ¹⁰⁹ Wodak, Ernst. Neue Beiträge zur Funktionsprüfung des Labyrinths. Monatschr. f. Ohrenh., 1922, v. 56, p. 826.
- ¹¹⁰ Würdemann, H. V. The relation of cupping of the optic disc to the visual fields in glaucoma. Amer. Jour. Ophth., 1927, v. 10, p. 831.
- ¹¹¹ Zange, J. Anatomie und Physiologie der mittelohrentspringenden Labyrinthentzündungen, J. F. Bergmann, Wiesbaden, 1919, p. 187.

NOTES, CASES, INSTRUMENTS

A PHOTOKERATOSCOPE

ROBERT VON DER HEYDT, M.D.
CHICAGO

This new instrument has made it possible to photograph Placido-disc images as they are projected onto the cornea. We thus obtain documentary evidence of our findings. Gullstrand and Fisher have both studied this problem. Deking of the Groningen Clinic showed an apparatus in 1929 which included the whole of the corneal surface in the picture. The newer apparatus which I have used was recently constructed by Carl Zeiss for Amsler of Lausanne. It was first shown at the Heidelberg Congress last year. It is simple in construction, because designed to depict only

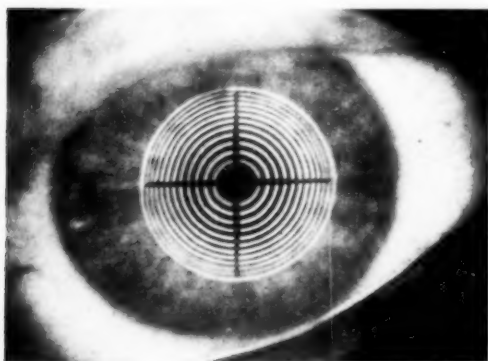


Fig. 1 (Von der Heydt). Disc reflection photographed on normal cornea.

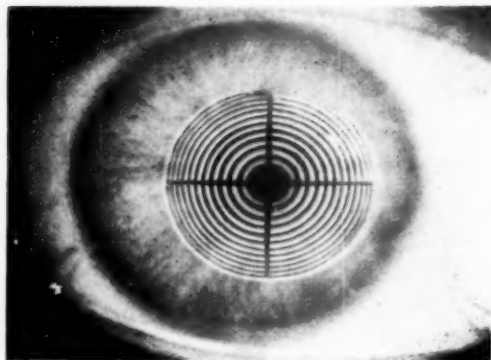


Fig. 2 (Von der Heydt). Disc reflection photographed on cornea with four diopters of astigmatism.

the image formed on the smaller important central corneal area.

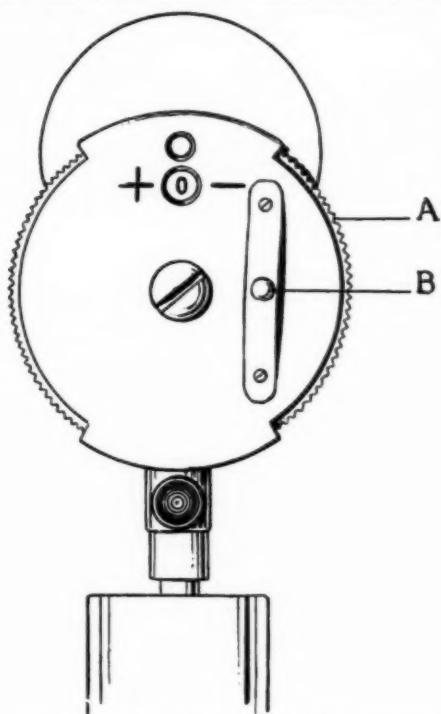
The pictures of incipient keratoconus, irregular and regular astigmatism, scar contraction, corneal ulcers and loss of corneal substance may be recorded. The photographs obtained are sharp and distinct. They are large enough to allow of mensuration, and clearly record all changes in surface contour.

25 E. Washington street.

A USEFUL DEVICE FOR AN OPHTHALMOSCOPE

ALGERNON B. REESE, M.D.
NEW YORK

This is an arrangement whereby the disc (A) containing the various lenses can be placed at zero by pushing the button (B) and revolving the disc. When zero appears in the aperture the disc locks and by releasing the button the disc is free to move in either direction desired for the examination. This



(Reese). Device for an ophthalmoscope.

is found useful for two reasons: 1. In using the ophthalmoscope in a dark room this device makes it possible to forego the necessity of turning on a light in order to place the instrument at zero before beginning the examination. If one wishes to begin the examination by first making an inspection of the media with a plus lens the examiner can at least orient himself as to where the disc is by returning it to zero by means of this device and then turning it a short distance on the plus side. 2. An examiner who is presbyopic can place the ophthalmoscope at zero without resorting to the use of a presbyopic correction.

This attachment is made by the Bausch and Lomb Company for the May Ophthalmoscope.

73 East 71st street.

COLOBOMA OF THE OPTIC NERVE

DONALD J. LYLE, M.D., F.A.C.S.
CINCINNATI

The patient, a girl aged five years, was presented because of poor vision and a slight convergent strabismus in the right eye since birth. The vision in the right eye was hand movements at thirty inches. Vision in the left eye was 20/20. The left eye was normal in every respect and will not be referred to further.

The right orbit, lids and anterior segment were normal. Intraocular tension

was normal. The pupil reacted to light but not to accommodation. Media were clear.

The optic nerve entrance was irregularly round in shape and greatly increased in size (Fig. 1). A complete ectasia of the distal end of the optic sheath was present which gradually narrowed towards the brain. The depth could not be determined either with the -50 D. ophthalmoscope or the concave focusing lens of the stereoscopic fundus camera (Fig. 2).

Along the walls of the nerve sheath vessels ascended and descended to and from the eye passing sharply over the edge of the crater. These vessels, having the arrangement of Casper's third group¹, appeared at the edges around the whole circumference of the coloboma with the resemblance to cilio-retinal vessels.

The scleral ring around the circumference of the coloboma was wide and irregular apparently from lack or loss of choroidal or retinal pigment, the area being blotched and stippled. A sheet of pigment dipped into the crater on the nasal side. The coloboma margins were raised several diopters above the retina. Above, this elevation fell away suddenly; temporally and below, where the elevation was greatest, it sloped down to the retina gradually.

Visual fields could not be determined as vision was poor and the child rather young for exacting cooperation.

The development of the part of the eye which is related to this case should

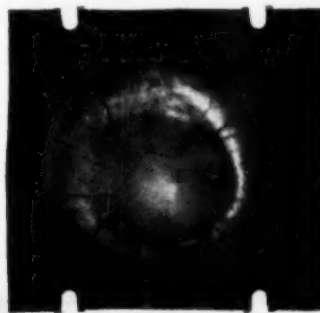
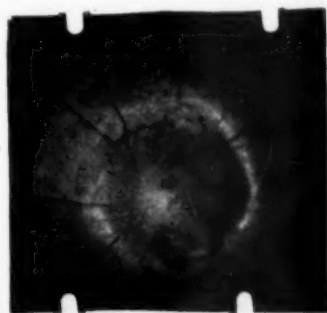


Fig. 1 (Lyle). Stereoscopic view of optic nerve entrance.

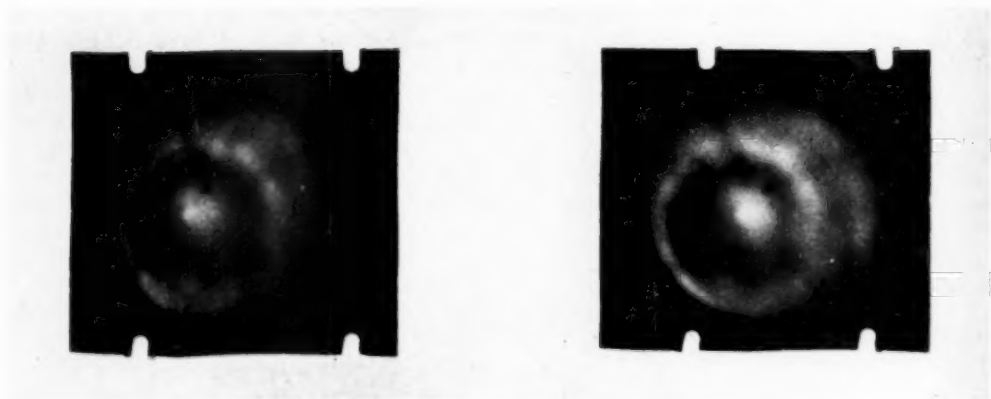


Fig. 2 (Lyle). Stereoscopic view of depth of coloboma.

be completed during the embryonal stage, that is, by the third month.

The optic vesicle of ectodermal structure develops. A shallow groove appears in the ventral surface of this vesicle. The distal end invaginates the optic cup which is connected with the developing brain by the short broad optic stalk (Fig. 3).



Fig. 3 (Lyle). Groove in ventral surface of optic vesicle.

This groove, which gradually forms a fissure, is deepest in the optic cup and becomes shallower in the distal stalk to disappear before reaching the brain (Fig. 4). Through the fissure there is an



Fig. 4 (Lyle). Disappearance of the groove.

invasion of mesodermal tissue which develops into vascular structures (hyaloid artery).

As this furrowing continues the invaginated part is gradually surrounded by the superior part of the cup and stalk which is aided by a filling in of the ventral sector through increased growth activity of the neighboring tissues until the defect is closed and the ectodermal layer becomes continuous. The cup and distal stalk now consist of two layers of ectoderm, outer and inner (Fig. 5).



Fig. 5 (Lyle). Optic cup and distal stalk showing outer and inner layers of the ectoderm.

Gradually the uniformity of the inner layer of the optic stalk ceases. The individual cells become irregular and vacuoles appear in them. The developing axone cylinders from the retina (ganglion cells of the inner ectodermal layer of the optic cup) penetrate through them or push them aside. Their remnants finally form the glial cells between the nerve fibers which become medulated shortly before birth. This formation provides a direct passage to the brain for the optic nerve fibers.

The space between the inner and outer ectodermal layers of the cup and stalk disappears. The outer layer forms the pigment layer of the retina in the eye. In the stalk it forms the neuroglial supporting structure of the optic nerve.

The choroidal and scleral coats of the eye are continuations of the meninges of the brain by way of the sheaths of the optic nerve, the sclera representing the dura and the choroid the pia mater.

As to the etiology of colobomata, the problem is far from a solution. There have been advanced many theories. The presence of an abnormality does not always indicate the cessation of growth at a definite stage of development, nor does it mean a "throw back" to a condition seen normally in more primitive species. If these conditions are taken for granted we still know nothing of the reasons for cessation of growth or reversion. Inflammations in embryo can not account for many of the anomalies.

Pleading ignorant to the primary exciting factors causing the condition of the case presented here, I should like, nevertheless, to present for consideration two possible secondary causes for the arrested or perverted development.

1. Outer ectodermal layer (nerve stalk) developmental defect.

A result of faulty nerve stalk formation in which the nerve entrance forms at approximately three times its normal diameter occupying the space of the most vital retinal area necessary to vision (macula and paramacula) with possibly normal retinal development over the remaining peripheral area: with proper coursing of the fewer than usual nerve fibers over the edge and along the wall of the larger than normal nerve sheath.

2. Inner ectodermal layer (retinal ganglion cell and axone cylinder) developmental defect.

A condition in which, the retina hav-

ing not completely or uniformly developed, the lack of the cerebralward pushing axone cylinders with their influencing action on the developing structures of the nerve stalk in passing interfered with the proper and normal closure of the nerve sheath.

909 Carew Tower.

References

¹ Casper, Dissertation, Bonn 1887.

The diagrammatical sketches of the developing eye were copied from Ida C. Mann, The development of the human eye, Cambridge University Press, 1928.

A NEW LID CLAMP

M. M. CRUICKSHANK, M.D.

Major, I.M.S.

MADURA, INDIA

This clamp was devised to enable one to evert the upper lid when performing Webster's operation for entropion. It is also useful when doing a tarsectomy.

The three bars bearing teeth are not in a straight line, the center one being slightly shorter. When they are placed beneath the lid, the plate of the clamp being on top, they lie just within the ciliary margin and along the natural



(Cruickshank). A new lid clamp.

curve of the lid. The clamp, placed in position, is tightened and the handle brought up over the eyebrow. In this way the lid is everted and spread out flat from canthus to canthus.

Messrs. John Weiss and Son, Oxford street, London, made the instrument.

Government Hospital.

SOCIETY PROCEEDINGS

Edited by DR. H. ROMMEL HILDRETH

ST. LOUIS OPHTHALMIC SOCIETY

October 16, 1931

DR. M. HAYWARD POST presiding

Constitutional therapy in ocular lues

DR. M. L. GREEN read a paper on this subject.

Discussion. DR. WILLIAM JAMES said he was especially interested in this topic. Since January, 1930, he had made routine ocular examinations, including visual acuity tests, visual field tests and ocular fundus examinations, on all cases of syphilis of the central nervous system treated at the Washington University Clinics. At that time the department of internal medicine had taken over the treatment of syphilis in the clinic and those cases with ocular involvement had been treated by the ophthalmologist.

Dr. James stated that recently he and Dr. Lee D. Cady had reviewed a series of cases of neurosyphilis and found they had treated twenty-five cases having optic nerve atrophy of the primary type. Among these fifty eyes there had been seventeen, which on admission, had visual acuity limited to hand motion or less; and twelve others with acuity of 3/60 or less; that is, twenty-nine eyes industrially blind before coming to the clinic. The remaining twenty-one eyes had visual acuity of 6/60 or better. The visual fields corresponded rather uniformly to the visual acuity, most field defects being concentric contraction.

It seemed to Dr. James, considering these cases, that only poor results could be expected when patients presented themselves with such advanced optic nerve involvement. Certain of these cases had responded well to treatment but Dr. James felt that poor results would continue if ophthalmologists persisted in telling patients with tabetic atrophy that the prognosis was bad and they were doomed to blindness. More-

over the patients should not be transferred to physicians unfamiliar with eye diseases without provision for further skilled ocular observation.

DR. CHARLES W. TOOKER believed that the patient's interest would be conserved if the ophthalmologist assumed responsibility for treating the disease, since arsenicals might be dangerous when syphilis affected the optic nerve. It was the habit to refer such patients to the internist or the neurologist thus making frequent consultations necessary to determine whether or not arsenicals were indicated. Where the patients were not able to afford such consultations with several physicians the ophthalmologist should take charge of the treatment or refer the case to a clinic.

DR. JOHN F. HARDESTY knew of one neurologist who never treated a case of neurosyphilis with arsenicals until an eye examination had been made. If the optic nerve was normal frequent re-examinations were made during the course of arsenical treatments. If optic nerve involvement were found, arsenicals were not used, at least not at first, and cautiously, if at all.

DR. M. L. GREEN, in closing, quoted the physician in charge of the municipal clinic as saying in his last report that treatment of neurosyphilis was not satisfactory without eye examinations at regular intervals. He had realized that a frequent rechecking of the fundus and visual fields was essential to the best interest of the patient.

Sporotrichosis

DR. C. J. GISSY read a paper on the ocular manifestation of this disease with a brief review of the literature and the report of a case. This paper will be published in the American Journal of Ophthalmology.

Discussion. DR. B. Y. ALVIS reported further observations on a case he had described in detail in a paper read be-

fore this society in 1926. The patient, a mulatto woman, had exhibited narrow ulcers extending along the inner surface at the margins of all four lids. The ulcers were about 1 mm. wide, covered with a white granular substance, noninflammatory, and not painful. They did not bleed readily. The scrapings had been cultured by Dr. Florence Edwards under the direction of Mr. Varney of the bacteriology department of Washington University.

Treatment had been carried out with potassium iodide, internally, and tincture of iodine applied locally at frequent intervals for a considerable period with no apparent effect on the ulcers. The patient had been seen recently after absence of many months. The ulcers had progressed a little in some areas and healed over in others. There was no adenopathy and no irritation except that occasioned by a few ingrowing lashes.

Dr. GISSY, in closing, mentioned that his patient had been sent to the hospital only the previous week with some vague abdominal trouble, with vomiting and fever. A general involvement as a complication of the sporotrichosis was feared. In some cases he said it had remained in the system without causing an active disturbance for some time. One author had stated that there was no direct action of the potassium iodide on the spore itself but that cure was effected by a walling off of the lesion.

Foreign bodies in both eyes for seven years

DR. J. M. FLURY reported the case of E. V., aged sixteen years, who had been injured by an exploding dynamite cap June 20, 1924. The ocular examination of the right eye had shown two small puncture wounds in the sclera near the corneal margin in the upper nasal quadrant. Slight iridodialysis, up and nasally was noted and numerous fine metallic particles in cornea and bulbar conjunctiva, with a little blood in the anterior chamber. There were beginning lens changes.

The left eye had shown two small puncture wounds in the lower third of

the cornea, beginning lens changes, and numerous small particles on cornea and bulbar conjunctiva.

Three days later the vision of the right eye was hand movements at one foot; left eye, 5/50. Both lenses were almost opaque, with little reaction in the right eye, more in the left.

A radiographic examination revealed five small particles in the right eye and two in the left. The magnet was tried without effect and the particles removed from the conjunctivas and corneas were nonmagnetic.

The lenses became opaque and in four months were absorbed. Vision O.D. was then 6/12, with a plus 12 spherical lens. The left eye had a thick capsule remaining with vision equal to counting fingers at one foot.

The vision of the right eye remained 6/12 for two and one-half years when thickening capsule reduced it to 5/60. May 4, 1927, the Wheeler operation was performed. Following this, vision was 6/5. Two subsequent needlings were necessary, the last after Ziegler's technique on December 7, 1928, after which vision of 6/6 with correction was obtained. This vision had remained for two and one-half years. No surgical operation had been performed on the left eye.

With the ophthalmoscope fine floating opacities were visible in the right vitreous but no foreign bodies were seen. The patient had finished high school and was now attending college.

The second case reported by Dr. Flury was that of a man aged forty-three years, Mr. W. T., whom he had first seen April 19, 1924. The left eye had been injured in 1902 with a steel fragment. No radiograph had been taken at the time but magnet extraction was attempted without result. The eye had become inflamed with vision reduced to light perception. There was ciliary redness, tenderness, and irritability. The tension was normal, pupil active, lens cataractous. Radiographs revealed the presence of a foreign body; magnet extraction was attempted but was unsuccessful. After enucleation a small piece of steel was found imbedded in the sclera for two-thirds of its length

with one-third protruding into the vitreous. The right eye was normal.

Discussion. DR. JOHN GREEN gave a brief account of a case he had observed. In 1921 a young man, aged twenty years, had received a fragment of a dynamite cap in his left eye through a scleral wound behind the ciliary body on the temporal side. Ophthalmoscopically the fragment appeared as a glistening dot behind the lens where its presence was confirmed by the x-ray. Vision remained 20/20 for two years when the vitreous began to cloud, and cataract slowly developed. A mild cyclitis was evident. After weeks of bed-rest, potassium iodide internally and atropin locally, the eye became quiet. Several disquisitions resulted in a clear pupil and vision of 6/6, with correction. After operation the x-ray showed no discernible shadow and no foreign body was seen ophthalmoscopically.

It seemed that the tiny copper fragment had been converted into a salt of copper, the chemical action initiating an irritation with resultant cyclitis, clouding of the vitreous and lens. Fortunately the eye had been able to cope with the situation with happy outcome.

DR. F. O. SCHWARTZ had had a case of retained foreign body in the right eye of a boy about eight years of age. The injury was the result of an exploding dynamite cap to which the lad had applied a match. The x-ray showed the foreign body far back in the vitreous. After absorption of the lens very good vision was obtained with correcting lens. The glistening yellowish or reddish particle was then visible with the ophthalmoscope, far back in the vitreous. Two years after injury he had developed sympathetic ophthalmia and was seen with disturbed vision in the left eye. Enucleation of the right eye was done and the retained metal fragment, probably copper, the size of a pinhead was found.

DR. W. E. SHAHAN thought it possible for a small fragment of copper to dissolve and disappear. He had observed a piece of a dynamite cap lying in the lower depth of an eye. Normal vision had been retained for four years. Then began a greenish discoloration of the

lens and iris showing a deposit of a copper salt. The eye became irritable and was removed. Dr. Shahan believed the particle might have been changed to chloride of copper and carried away had it been small enough. The vitreous was fluid and its base and adjoining parts stained greenish blue showing that some of the copper had dissolved.

BENNETT Y. ALVIS,
Editor.

COLORADO OPHTHALMOLOGICAL SOCIETY

October 17, 1931

DR. C. A. RINGLE, presiding

Recurrent and alternating episcleritis

DR. E. M. MARBOURG presented a patient who had had his first attack of episcleritis when husking corn about a year ago. Since then both eyes had been alternately and at times simultaneously involved. He had not had much pain, but had done better when the pupils were kept well dilated. He had bad tonsils which he had refused to have removed. Foreign protein injections with good systemic reaction had been used with little effect on the eyes.

Discussion. DR. D. H. O'ROURKE said that he had been treating such a case for a year without satisfactory result. He said he had used Verhoeff's method with tuberculin, an antrotomy had been done, x-ray pictures had been made of every suspicious area, and sodium salicylate and foreign protein had been tried. Dermatitis of the lids had developed from administration of either atropin, homatropin, or scopolamin.

DR. WM. C. FINNOFF said he had tried Benedict's suggestion that the cervix in women might be the focus of infection and had used a vaccine made from cervical flora, but had had no success. Dr. Finnoff believed that this case was not one of tuberculosis because the lesion was too superficial.

DR. WM. C. BANE said he had used high frequency current with good results.

DR. WM. H. CRISP believed this was a case of episcleritis rather than scleritis, for the latter had a more purple color.

Dr. Crisp mentioned that in this country we were prone to consider various focal infections as the usual etiological factor in many obscure ocular conditions, whereas in Europe the physicians assumed that practically all cases were tuberculous in origin and that improvement after removal of auxiliary foci was merely an expression of getting the body into better condition to cope with the tuberculosis. Dr. Crisp urged cycloplegia for these cases and suggested the thermophore and refraction in the treatment. Dr. Crisp also wondered whether the ill-kept dental prosthesis that the man was wearing might in some way enter into the etiology.

DR. GEORGE H. STINE mentioned that he had had a case and heard of others where an infected dental stump had been found buried in the gum under the prosthesis.

Sympathetic irritation

DR. E. M. MARBOURG presented a twelve year old boy who had been struck in the left eye by an arrow, rupturing the cornea and causing a prolapse of the iris into the wound. The eye was badly contused. Prolapsed iris had been excised by another oculist at the time of the injury. Inflammatory conditions subsided satisfactorily as far as the primary trauma was concerned, but the eye steadily progressed to a state of phthisis bulbi. In about two months after the injury the patient complained of photophobia in his uninjured eye. Enucleation of the injured eye was done and in 24 hours after the enucleation the photophobia disappeared.

Discussion. DR. EDWARD JACKSON said that it was especially important to remove an exciting eye in children as soon as photophobia appeared in the other eye, for all cases of recovery of sympathetic ophthalmia had been in adults, and children were much more liable to have sympathetic ophthalmia. Dr. Jackson said he had seen one case of a man forty years old who had had three attacks (two of them after the enucleation) and yet had recovered with normal vision.

DR. WM. C. BANE said that the patient whom Dr. Jackson mentioned had been in his office only three days previously and still had normal vision. The injury which had occurred 32 years previously had consisted of a piece of iron entering the eyeball, the presence of which had been diagnosed by the sideroscope. He had been given thirty grains of sodium salicylate every four hours for four days, mercury by inunction, and atropin locally.

DR. E. R. NEEPER mentioned that salvarsan had been suggested as a treatment for sympathetic ophthalmia.

DR. G. H. HOPKINS said he had seen salvarsan used with good results. Dr. Hopkins also recited a case where a piece of iron had gone through the lids of an eye and had buried itself in the ethmoid region. The eye was now quiet and practically normal in size. Dr. Hopkins asked whether there was just as much danger as though the foreign body had remained in the eye, whether an attempt should be made to remove the foreign body, and whether siderosis would be apt to occur?

DR. EDWARD JACKSON answered that Dr. John McReynolds had written a paper in 1919 in which he said that the danger from sympathetic ophthalmia was not from the foreign body, but from the trauma. Dr. Jackson recommended the removal of the foreign body because of the undesirable effects that might develop in the sinuses and bones, and believed that siderosis would not occur in such cases unless the iron was within the eyeball. Dr. Jackson further said that good drainage should be provided in any operation when the foreign body had gone through the eye, for one case had been reported of meningitis occurring six weeks after an enucleation.

DR. WM. C. BANE said that his son, Dr. Wm. M. Bane, had removed a piece of iron from the orbit in such a case by dissecting back alongside the eyeball and applying a magnet.

DR. WM. C. FINNOFF reported a case of sympathetic ophthalmia following a cataract extraction. The patient, a Christian Scientist, would not allow enucleation until two weeks after the

onset. The patient refused all medication except atropin. There was one later attack of less severity, but the eye had now been entirely quiet for eighteen months.

DR. MARBOURG (in closing) mentioned another case in which striking the stump of an eye sixty years after the original injury had initiated an attack in the other eye of what appeared to be sympathetic ophthalmia. No histological examination had been made.

Xerosis of the conjunctiva

DR. E. R. NEEPER presented L. H., a nine year old undernourished girl, who had been first seen in February, 1931, for a routine institutional examination of her eyes. The eyes were normal except for a xerotic area about 3 mm. by 5 mm. extending out from the temporal limbus on the right eye. About six weeks later a similar area appeared on the left eye. Mild astringents had been the only medication.

Discussion. DR. WM. H. CRISP said he had seen several cases with similar patches in which there had been no clinical manifestations. Dr. Crisp suggested the use of the thermophore.

DR. WM. C. FINNOFF reminded the society of the cases he had shown several years ago in which there had been a history of malnutrition.

DR. J. J. PATTEE said he had seen a few such cases at Moorfields and in his own practice. The appearance had not changed over a period of years.

DR. J. M. SHIELDS said that Dr. Neeper's case was the most marked that he had ever seen.

Keratitis and glaucoma following cataract extraction

DR. G. H. STINE presented Mr. J. O. McC., a sixty year old farmer, whose left eye he had operated on for cataract three months previously. There had been no unusual finding in the history or examination, including the tension by tonometer, before the operation.

On July 7, 1931, a combined extraction with a large conjunctival pocket flap was done. Forty-eight hours after the operation the dressings were removed and found to be saturated with

tears. There was nothing unusual in the appearance of the eye. The next day there was considerable edema of the conjunctival flap, with some striate keratitis. On the fourth day a faint milk-like opacity covered the entire posterior surface of the cornea. Otherwise the eye was doing well. Atropin and dionin were used, and the patient was given a course of milk injections. Ten days later there was very little change in the appearance of the corneal opacity. There was some epithelial bedewing. The tension was 17 mm. (Gradle-Schiøtz). Since that time the eye had quieted down completely. The posterior opacity was still present, but was clearing somewhat. The pupil, in the meantime, had dilated widely, especially below. Atropin was discontinued. At the end of a month the corneal striation had cleared considerably, but the epithelial bedewing was still present. The tension was normal. The pupil was still widely dilated and clear. In the following month there was little change, except that the tension gradually rose from 17 to 30. The patient was given pilocarpin 1 percent and dionin 2 percent to use, but this had little effect on the tension. Within the next month there developed a grayish opacity in the epithelium of the cornea extending inward for about 3 mm. from both the temporal and nasal limbus. The fine striation in Descemet's membrane and the epithelial bedewing were still present. There was also faint infiltration in the posterior third of the substantia propria. The tension fluctuated between 20 and 30, pilocarpin and eserine having little effect upon it. At the end of the third month a paracentesis of the cornea was done to differentiate between degeneration of the cornea and a corneal opacity due to glaucoma. With the release of the aqueous there was considerable clearing of the epithelium, but no change in the posterior opacity. The aqueous was allowed to drain for two days after which the tension rapidly rose, fluctuating between 38 and 50, with increased epithelial opacity. At no time was the eye painful.

Dr. Stine planned to do a cyclodialy-

sis for relief of tension and to determine the effect on the corneal opacity.

Discussion. DR. WM. C. BANE advised a posterior sclerotomy as a temporary measure to be followed by a corneoscleral trephining. Dr. Bane mentioned that he had even used a posterior sclerotomy to good advantage in a case of increased tension from a traumatic cataract.

DR. V. H. BROBECK said that he was not in favor of the large pocket flap because in his opinion it decreased nutrition of the cornea and decreased the visibility while making the section.

DR. WM. H. CRISP recited a case of intracapsular extraction in which the capsule had ruptured as the lens was being withdrawn with the forceps. There was delayed healing of the wound, but this was cared for satisfactorily by a sliding conjunctival flap. Some weeks later he made a single cut in a delicate pupillary membrane and this was followed two hours later by an acute attack of glaucoma. Eserin had controlled the tension quite well, but Dr. Crisp believed he would later have to do an iridencleisis or some other filtration operation.

DR. J. M. LAMME believed the opacity in Dr. Stine's case was due to lack of nutrition to the cornea.

Optic neuritis and postneuritic optic atrophy due to thallium acetate (Koremlu depilatory cream)

DR. G. H. STINE reported the case of Miss Z. D., aged forty-seven years, whom he first saw on August 6, 1931. The complaint was blurring of near vision and asthenopia. No defect in distant vision had been noted. The patient was wearing +1.50 spheres, prescribed for reading six months ago by an optician. She had been suffering from neuritis in both legs since last April. Her physician had been considerably perplexed as to the diagnosis until he had read of cases of thallium acetate poisoning occasioned by the use of Koremlu depilatory cream. The patient's general condition had improved considerably following the use of calcium, the iodides, sodium thiosulphate, and other eliminative measures.

External examinations, the pupils, and ocular movements were normal.

Examination of the fundi showed the media to be clear. In the right eye there was definite pallor of the temporal half of the disc, the margins were very slightly irregular, the lamina cribrosa was well defined and broad. The arteries were somewhat contracted; both inferior and superior temporal arteries were rather irregular in caliber. There were numerous punctate glistening white dots in the macula. In the left eye the disc appeared larger and had a dirty succulent appearance as if slightly swollen. The physiologic excavation was obscured. The margins of the disc were indistinct. The capillarity was normal. There was slight contraction of the retinal arteries. The vision in the right eye was 0.3 and in the left 0.6. With the old reading glasses the near point was, right 3.75 D., J. 4 and left 3.75 D., J. 1. The muscle balance was essentially normal. The shadow test indicated -0.25 D. sph. in each eye.

Fields taken on the modified Ferree-Rand perimeter with $\frac{1}{2}^{\circ}$ form and 1° color targets showed a practically normal field in the left eye. In the right eye there was an absolute sector defect running from the disc to the periphery in the upper nasal quadrant. There was a superior altitudinal hemianopsia for red and green. The stereocampimeter showed a large absolute scotoma about 10° in width extending from the blind spot horizontally nasalward in the right eye. The lower border of the scotoma encroached upon the macula. In the left eye there was an enlargement of the blind spot with a wing-shaped absolute scotoma about 4° wide extending from the upper nasal margin nasalward to a point just above fixation. There was a similar, but much smaller one extending from the temporal margin outward. This scotoma was larger for $\frac{1}{2}^{\circ}$ red test object.

The patient reported in one month stating that her general condition and the eyes had improved. The vision was, right 0.5+ and left 0.9. There was no change in the near point, but the patient could read J. 1 and 2 with the

right eye. The right disc showed somewhat increased pallor. The left disc did not appear quite so swollen. There was slight pallor of the extreme temporal portion of the disc, otherwise there was no change. Fields taken on the stereocampimeter showed no change in the scotoma in the right eye. The central red field for $\frac{1}{2}^\circ$ test object had enlarged considerably. In the left eye the scotoma extending nasalward from the blind spot had broadened and intensified slightly. The central red field for $\frac{1}{2}^\circ$ test object had broadened out considerably as in the right eye.

Dr. Stine reported the case because of its rarity. There had been numerous cases of multiple neuritis due to thallium acetate poisoning reported in the recent literature, but he had not so far seen a report of optic neuritis due to this cause.

Bilateral paresis of the superior oblique muscle

DR. G. H. STINE reported the case of Mr. W. B. B. He had performed a refraction on August 21, 1931, without unusual findings in refraction or muscle balance. A month later the man was kicked in the left mastoid and temporal region rendering him unconscious for eighteen hours. Upon recovery he noticed double vision especially in the lower fields. Central vision was normal. There were only slight general neurological signs. The right eye was slightly down under cover and the left slightly up under cover. No limitation of motion could be seen. Diplopia fields showed single vision in all directions of the upward gaze and in the primary position. On looking down and to the right there was homonymous vertical diplopia, with the image of the left eye below and the separation increasing progressively downward. On looking straight downward the diplopia was homonymous, but the images were level. On looking down and to the left there was also homonymous diplopia with the image of the right eye below and the vertical separation increasing progressively downward. On looking to the right there was vertical diplopia with the image of the left eye below,

and on looking to the left the image of the right eye was below. Tests with Maddox double prism showed the eyes to be extorted. Fields of fixation, however, showed no definite diagnostic involvement of an ocular muscle.

There was faint blurring of the upper margins of both discs; otherwise the fundi were normal. Detailed field examinations revealed nothing more than slight enlargement of the blind spots. There had been no change in the paresis in two weeks. The patient had been put on mercury and iodides, and one eye was being occluded to avoid the diplopia.

Dr. Stine said that the only other such case he could find in the literature was the one reported by Duane in the Archives of Ophthalmology in 1897.

Discussion. DR. EDWARD JACKSON said he had seen unilateral cases from a blow on the back of the head, but had never seen a bilateral case. Dr. Jackson recommended the use of iodides.

DR. E. M. MARBOURG said he had heard of superior oblique involvement after mastoid operations.

RALPH W. DANIELSON,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

October 19, 1931

DR. FRANK BRAWLEY, president

Disciform keratitis

DR. SCHAUB presented a fifteen-year-old girl who had been under observation since August 15 because of failing vision in the right eye, starting three weeks previously. Vision was now 20/200. Upon examination a disc-like opacity was seen in the cornea, more dense centrally, fading toward the periphery, with a clear area near the limbus. The etiology was uncertain. The tonsils had been removed, but the opacity had begun to clear under instillations of dionin, before this was done.

Retinal detachments

DR. SCHAUB also showed a forty-five-year old woman who first came under observation in January, 1930, for re-

fraction. Vision at that time was approximately 20/20. She was not seen again until October 7, when she returned complaining of failing vision in the left eye. The vision O.S. was 10/200; unimproved by correction. External examination was negative. Ophthalmoscopy showed rings, concentric with the margin of the disc, fading into the macular region; retinal edema and detachment. She had been under treatment since that date. There was some possibility of tumor as the etiological factor. The fields showed central scotoma, which did not correspond to the fundus picture. The peripheral field was narrowed concentrically.

Shrunken orbit following radium therapy

DR. SANFORD GIFFORD showed a six-year old girl, and asked Dr. Blair's opinion as to what should be done. The eye was enucleated on account of glioma when she was one year old. This was followed by radium therapy and she now had a little band of cicatricial tissue, with some shrinkage of skin and naevi as a result of the radium.

Discussion. DR. VILRAY BLAIR said that it was important to fit an eye into the child's socket as soon as possible, on account of the expansion of the orbit that might result. He thought that in this, as in all other cases of contracted conjunctival sac and loss of globe which he had observed, the lack of space for the reception of an artificial eye was not due to the filling of the orbit by scar tissue but to lack of sufficient conjunctiva, which deficiency holds the lids in the retracted position. To correct this he would make a circumferential cut through the conjunctiva all the way around, following the line of junction between the palpebral conjunctiva and that part of the membrane which covered the remaining orbital contents. A finger dissection should then liberate the lids and allow them to be thrown well forward, leaving a broad belt of exposed raw surface. From the drawing back of the upper lid which he observed when she attempted to open the eye, he judged that the levator palpebrae muscle had be-

come too much shortened to allow proper advancement of the upper lid without cutting this muscle.

Having liberated the lids sufficiently, the next step was the insertion of the lining skin graft. To do this the tarsal borders were steadied and drawn forward, each with two silk traction sutures, which facilitated the introduction into the new eye socket of a "Mikulicz" pack of gauze that used as a tent a piece of split skin graft about three and one-fourth inches square, if such was available. The substitution of a strip of gauze to support the skin graft, in place of the more commonly used wax form, permitted full expansion and grafting of the whole cavity at one operation without a canthotomy.

The radium damage to the skin of the lids could be relieved by dissecting off a superficial layer of the scar and resurfacing with Gillies "outlay" grafts, and the ptosis that would result from the cutting of the shortened levator palpebrae muscle could be corrected by attaching the upper tarsal border to the occipito-frontalis muscle by strips of fascia lata.

Bell's palsy

DR. THOMAS D. ALLEN showed a man with Bell's palsy of about two and one-half years' duration, who had apparently had no inflammation of the ears. It occurred on the left side, on which side was his only seeing eye, the right eye having been blind since a childhood injury. Vision in the left eye with correction was 20/20. On account of the exposure due to the palsy, he developed a keratitis with ulcer in the lower portion of the cornea. The lids were sutured together in the usual way to reduce the palpebral fissure.

Discussion. DR. VILRAY BLAIR said that the important thing was to care for the eye. Loops of fascia would improve what had been done for preservation of the eye. If fascia was put in it should be put close to the tarsus, on the bone holding the lids up. So far as the rest of the face was concerned, by putting loops of fascia in the upper lid, hooked right into the unparalyzed muscles and pulled to the proper tension,

much could be done. It should be left with over-correction to hold it up. If one loop slipped the others would hold. It was curious to note how motion on one side would compensate for lack of motion on the other.

Blepharoplasty and ptosis operative procedures

DR. VILRAY BLAIR showed a large number of slides illustrating congenital and traumatic defects. The results obtained by operation were discussed and operative procedures and complications.

Discussion. DR. MICHAEL GOLDENBURG asked if Dr. Blair would explain how the fascia lata implants were made. Also, what success he had had with orbits where it was necessary to establish a cavity or cul-de-sac in which an artificial eye could be worn, particularly when there had been many operations and the space was filled with dense connective tissue.

DR. WILLIAM H. WILDER mentioned a case of his own of involvement of the upper eyelids with blastomycosis, in which even while the disease was active it was possible to save the eye by a Wolff graft.

DR. VILRAY BLAIR (closing) said that before attempting to correct a ptosis after the plan described of connecting the tarsus of the affected lid with the occipito-frontalis muscle, the conditions in each case were studied repeatedly. Having contrived to have the patient close both eyes evenly, the paralyzed lid was gently raised with the finger, while the patient closed the eyes firmly without squeezing, which would permit the observer to note to what height the lower lid would follow the elevated upper in the attempt to close the fissure. The height of this extra excursion of the lower tarsus plus approximately two millimeters was the distance that the upper tarsal border was drawn away from the lower, when the patient was under full anesthesia, by the tendon loop that was to attach the upper tarsal border to the occipito-frontalis muscle.

Brown duo-chrome refraction test

DR. MILTON JACOBS read a paper on this subject which will be published in

the American Journal of Ophthalmology.

Discussion. DR. M. L. FOLK spoke of the Clason apparatus made by Bausch and Lomb, which was based on the same principles but had some advantages over this one. It was much simpler, having only one switch and the testing letters could be enlarged so that one could get 8/200 type for patients with very poor vision. It was not a method of refraction, but might be used, perhaps, to check refraction. Whether the result obtained was worth the time and expense consumed was questionable.

DR. ROBERT VON DER HEYDT said that in trial case refraction it was not necessary to tire the patient by having him repeatedly read the line under observation. It did not take an expert trial lens juggler long to get the patient down to the 20/20 line. Have him watch and concentrate on this line in general and not on letters which might have excited his curiosity while the finer points were worked out. Thus one might perform a refraction on an intelligent patient with a minimum amount of loud reading, except for the purpose of record.

DR. THOMAS D. ALLEN said that he had been interested in having Dr. Jacobs check up on his own prescription; with rotating block and spheres only. Dr. Jacobs obtained within 1/8 diopter of the glasses worn in less than five minutes. It was not a very practical instrument; it was a plaything. Once in a while where there was a very fine differentiation, where a patient could not make up his mind about 1/4 diopter one way or the other, this method would help the decision.

DR. MILTON JACOBS (closing) said that there appeared to be a psychological effect on the patients in the use of the duo-chrome test, the colors aroused their interest because it was something new to them; the test was not any more accurate than when white light was used, but it was useful as a method of checking. As Dr. Allen said, it appeared more accurate in small errors. There were other tests of this same order; the French investigators Pech and Imbert had used a test with red and

blue light, but with test letters and stationary radiating lines instead of the revolving disc. In the use of red and blue, the patient was seated five feet from the apparatus, which distance was an advantage for a small office. The diffusion circles of these colors on the retina were of the same size at that distance, and that point had been called the paradoxical point, it being the place where the patient saw both colors equally distinct. In reality it was the place where both colors were equally blurred, hence the name.

ROBERT VON DER HEYDT,
Secretary.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

November 16, 1931

DR. HILLIARD WOOD, chairman

Cystoid cicatrix

Dr. W. G. Kennon reported a case of cystoid cicatrix of the sclerocorneal wound following cataract extraction. There had been backward dislocation of the lens at operation necessitating removal with the loop. There had also been considerable loss of vitreous. A large iris prolapse had occurred at the outer angle of the corneal incision.

Two months after operation an irregular lobulated thin walled cyst was present. Treatment by pressure bandage was of no avail. After consultation with Dr. Hilliard Wood the idea of surgical procedure was abandoned.

One-half saturated solution of alum was applied over the cicatrix at intervals during one month in which time definite improvement was observed. The cyst became flattened and its walls thickened. Vision was 20/100 with glasses.

Bilateral optic neuritis

DR. HILLIARD WOOD reported the following case of bilateral optic neuritis and presented the patient. J. D., white, male, aged twelve years, was seen October 28, 1931, at which time he gave the history of having irregular fever for the past week with gradual impair-

ment of vision in each eye. There had been no pain. Quinine in small doses, had been given for a few days, approximately 30 grs. in all.

Examination showed: O.D. Vision, 8/200, not improved with lenses. O.S. Vision, 20/15. Pupils were normal in size and appearance.

Right eye: Very severe neuroretinitis, principally optic neuritis. There appeared some infiltration in the macular region that might explain the low vision of this eye. The disc was swollen two to three diopters. There was no hemorrhage, but there was marked inflammatory edema in and around the disc.

Left eye: A condition similar to that in the right, but not so severe, was found. The macular region was not involved.

The nose, antra and frontal sinuses appeared normal. There was no history of tonsillitis, but the tonsils were septic. The urinalysis was negative.

A diagnosis of bilateral neuroretinitis of unknown etiology was made and a general physical examination advised. A complete physical examination was done at Vanderbilt University Hospital where it was thought that the neuroretinitis was probably caused by quinine.

A week later the vision in the right eye had improved to 20/65. The patient was placed on bichloride of mercury and iodide of potash for their sorbefacient action.

After the second week the vision of the right eye had improved to 20/50 and that in left eye had remained 20/15. There had been noticeable improvement in the optic neuritis in the right eye while that in the left eye showed little improvement.

Discussion. It was the opinion of the members present that, rather than quinine, the cause of the optic neuritis was to be found in the cause of the febrile condition. They advised that if x-ray of the paranasal sinuses was negative the patient's tonsils and adenoids should be removed.

H. C. SMITH,
Secretary-Treasurer.

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THE PROBLEM OF LITERARY RESEARCH

For most physicians the periodical literature of medicine serves only a fleeting purpose. Many make almost no use of the journals to which they subscribe. A fair percentage read rather diligently from week to week or from month to month.

Among those who pay rather diligent attention to their special journals, relatively few make any systematic attempt to retain for future use what they have read. An occasional fact, a new surgical technique or a new medicinal agent, sometimes the description of an unusual case or of some refinement in diagnosis, is kept in memory and is discussed with fellow practitioners.

Here and there, the particularly studious, by a considerable expenditure of time, and with or without clerical assistance, construct their own card files of reference to articles in which they are interested and of which they expect to make further use.

Most ophthalmologists seldom or never write essays on medical topics. Few of those who do write such essays have easy access to a satisfactory medical library, and the difficulties of medical research are such that it is employed only to a limited degree in the preparation of papers for medical societies or for publication in medical journals.

One has to admit that the compilation of bibliographies is occasionally very much overdone, but literary research has its distinct value to both writer and reader, and is essential to medical progress. It is the liaison officer between past and present, it insures the proper accumulation of evidence in the fight against disease, and it safeguards us against those mistakes which are due to ignorance of what has been done before.

Much devotion and enthusiasm have gone to the various efforts to classify and summarize medical literature so that it might be readily available to

the average worker or writer. One of the achievements most greatly to the credit of the American Medical Association is its systematic listing and abstracting of periodical literature.

Unfortunately, the general mass of medical literature is so enormous that the important minority who devote themselves to literary research in a specialty are in need of indexes and digests particularly devoted to their restricted field. Even to those who can take time for research in a national library, it is usually essential that literary resources shall be available in translation in the compressed form of abstracts or digests.

The indexes of special medical journals are seldom very thorough, and for the most part the abstract departments of ophthalmological journals have offered their material without very orderly selection and with very many important omissions. For readers of the German language, the *Klinische Monatsblätter für Augenheilkunde* and the *Zeitschrift für Augenheilkunde* have furnished excellent abstract departments or digests, these latter usually much delayed and more or less restricted to the literature of Central Europe. Readers of the American *Journal of Ophthalmology* are sufficiently familiar with the best abstract department in ophthalmology at present available in the English language.

Several attempts have been made to furnish annual digests of the international literature of ophthalmology. The earliest and the most persistent was "Nagel's Jahresbericht," a publication which is now represented by the *Zentralblatt für die gesamte Ophthalmologie und ihre Grenzgebiete*. The Ophthalmic Year Book was initiated by Dr. Edward Jackson in 1904, and, after furnishing for a good many years a comprehensive key to new thought and statement in ophthalmology, it expired in 1927. Its place is only partly filled by the abstract department of the American *Journal of Ophthalmology*.

The passing of the Ophthalmic Year Book is still deeply regretted by many ophthalmologists. Its discontinuance was primarily due to lack of financial

support. The number of active contributors to the expense of issuing the Year Book as a separate publication was always very limited. The problems—administrative, editorial, and linguistic—of assembling the ophthalmic literature of the whole world from year to year, without undue delay, and in a convenient and reliable form, can only be overcome upon a permanent basis by one or a combination of two methods: either through the creation of a large endowment fund (probably at least one hundred thousand dollars), or the annual pledging of a considerable sum of money from one or more national organizations. A small permanent force of well educated clerical or literary assistants is advisable, and modest honoraria should be provided for medical collaborators.

Only those who have actively engaged in editing and publishing such a digest of the literature can have any adequate understanding of the difficulties to be overcome, or the amount of work involved. A publication of this kind will never command a large circle of readers or a number of regular subscribers sufficient to make it self-supporting under the vicissitudes of changing editorship and literary staff. If it is ever again undertaken with more than the most faltering prospect of efficiency and permanency, the capital funds employed must be set aside with a full understanding that direct benefits will be limited to relatively few active scientific workers, and that the larger benefits may be even more vague and intangible than those to be derived from a great endowed institution of pathological or bacteriological research.

Perhaps some day a task of this kind, in relation to both of the allied specialties collectively or severally, will be undertaken by the American Academy of Ophthalmology and Otolaryngology, with help from one or more of the philanthropic foundations. *W. H. Crisp.*

ULTIMATE DISPOSITION OF PERSONAL MEDICAL LIBRARIES

Every medical man accumulates through the course of years, a consid-

erable number of books, magazines, monographs and reprints, many of which for various reasons may have a distinct value. Some of these would be of use in filling in deficiencies in series in public libraries. Others, because of their rarity or because of the importance of the subject matter which they contain, would have a reference value, which they possess only when they are made readily available to writers or research workers. These, while often scientifically important have usually little commercial value, and if no adequate provision is made for their ultimate disposition in some library, college, hospital or clinic, on the death of the owner, are left to gather dust on old shelves or are scattered through second hand book stalls and practically lost. In the publication of transactions of medical societies there is almost always a number of printed copies beyond the actual requirements of the membership. These accumulate in basements or storehouses occupying space which can often be illy afforded and where they are of no practical use whatever. The same is true in regard to medical journals. If a reasonable number of copies of these be reserved to meet the occasional calls that are made for them this should suffice for all necessary requirements. Why not open a way for the suitable disposal of such excess volumes of literature so that their usefulness might be continued?

Some of our medical periodicals might serve as a medium through which could be communicated the special needs of libraries for journals required to complete series or of volumes especially needed to fill omissions. The publication from time to time of lists of such desired volumes would inform the readers where donations would be acceptable or bequests could be advantageously used. In this way it would be possible to have many of the deficiencies supplied at small expense and little effort. Volumes which might otherwise join the over-crowded ranks of the unemployed would be given, thereby, a further life of usefulness.

Park Lewis.

BUCKY'S BORDER RAYS

Internationalism in medical terminology is highly desirable, but the form of internationalism which consists in blind adoption of words from a foreign language is illogical and objectionable.

The responsibility for such mistakes often lies primarily with manufacturers of drugs or medical appliances, who take foreign nomenclature ready made, because it sounds a little more mysterious and imposing.

The name of Dr. Bucky, a distinguished roentgenologist trained in Leipzig, Germany, but now practicing in New York City, has been descriptively associated with certain wave lengths of radiant energy intermediate between the shortest ultraviolet and the longest roentgen rays.

Bucky's border rays, also known as "supersoft" or "w-rays," resemble x-rays in that they are produced by a unidirectional electrical current passing through a vacuum and impinging upon a dense target; but their penetrating power is so low that they are intercepted by the glass of an ordinary Coolidge tube, and they can only be put to practical use by incorporating in the Coolidge tube a window of very thin aluminum or extremely thin glass. Apparently their action upon the tissues is not yet entirely understood, but they have very little penetrating effect, and hence for superficial use they are probably safer than radium and ordinarily roentgen rays. They have been applied particularly to various forms of dermatitis, and in the eye to a number of disturbances of the cornea.

When Bucky wrote in German about these rays they were naturally given the title of "Grenzstrahlen," which, quite literally translated into English, means "border rays". In America it has become rather common to speak of these rays by their German name, or, what is even more ridiculous, to retain the first half of the German expression and to translate the second half into English, forming the hybrid "Grenz rays", as though they might have been invented or discovered by a gentleman of the name of "Grenz"! Even so highly

intelligent a volume as Sanford Gifford's new "Handbook of ocular therapeutics" speaks of "the use of the Grenz rays described by Bucky." The expression is comically suggestive of "Pennsylvania Dutch"!

Neither in logic nor convenience does there seem to be any good reason why "Grenzstrahlen" should not be translated literally as "border rays".

W. H. Crisp.

SCHILLING COUNT IN THE DIAGNOSIS OF TUBERCULOSIS

One of the most mooted questions in ophthalmology is the causal relationship of tuberculosis to ocular inflammation. Ophthalmologists attribute to tuberculosis from four percent to sixty percent of cases of intraocular inflammatory disease. The reason for such a divergence of opinion is obviously the inability to examine histologically more than a tiny fraction of the total number of these cases. Aside from the pathological diagnosis from the enucleated eye or rarely a specimen from biopsy, there can be no positive proof. In addition there is a small group in which the diagnosis can be made with reasonable certainty, composed of those eyes which exhibit characteristic nodules of the iris when other known nodule forming agents are absent. Where these diagnostic evidences are not present the physician has been forced to seek further for data on which to base a differential diagnosis.

Tuberculin, in one form or another has been used extensively to prove whether tuberculosis is the underlying lesion. No test has been entirely satisfactory because there are many factors which influence the findings so greatly as to throw considerable doubt on the interpretation of the reaction. Probably the intradermal use of small doses of old tuberculin is the favorite method just now. It has been shown, however, that many cases of active tuberculosis do not give a positive skin reaction. On the other hand, even if a positive reaction is obtained there is nothing in the

nature of the local reaction to indicate whether it is due to an old healed lesion or to an active process. It is true that at times a so-called focal reaction is initiated at the site of the lesion. This, however is not common. It occurred in twenty-two percent of active cases in a large series reported from Saranac in September 1931. This is hardly a sufficiently high percentage to be of convincing diagnostic importance.

The general or temperature reaction also occurs with no great regularity. Undoubtedly the tuberculin test has real significance but equally surely, it leaves much to be desired. It is probable however, that this is still the best diagnostic procedure at the disposal of most ophthalmologists but it is possible that something better may supersede it and there may even now be a more accurate test at hand.

Those who studied hematology fifteen or more years ago were taught differential blood counts after the method of Ehrlich, which was undoubtedly the best method known at that time. They continue to think in terms of the Ehrlich differential although for some years the method of Victor Schilling has been steadily gaining recognition as a more exact procedure. The great difficulty with this method as with most refinements in technique of every kind, is that it requires far more training to learn and infinitely more experience to interpret. Merely to become familiar with technique requires many weeks of study. All of the interpretations are by no means universally accepted but some of the findings undoubtedly are correct.

In general the difference between the Ehrlich and the Schilling differentials is the further separation of the neutrophilic polymorphonuclear elements. The basophiles, eosinophiles, lymphocytes and monocytes are counted in the same manner in both tests. The neutrophils are divided into myelocytes, juveniles, "stabs" or rod nuclears and segmented forms. This is fundamentally an age distinction, the youngest cells being the myelocytes which have large, single, rounded nuclei occupying a very big part of the cell, surrounded

by a grossly granular protoplasm; the juvenile cells have one crescentic or horseshoe shaped, rather large nucleus, occupying somewhat less of the cell than the nucleus of the myelocyte and containing occasional nucleoli, surrounded by more protoplasm, less granulated; the stabs which have single, usually markedly curved, worm-like nuclei, surrounded with much protoplasm containing finely granular material; and lastly the segmented forms which contain two or more nuclei (the only true polymorphonuclears). Myelocytes never occur in normal blood; juveniles very rarely; stabs make up from three to five percent of the total while the segmented forms are the commonest, averaging about 55 to 65 percent.

Infections of various types react in different ways on the differential count. The change in the blood picture of patients with active tuberculosis following the diagnostic use of tuberculin is characteristic, according to Dr. J. F. Bredeck who has studied the question extensively and just recently has completed a series of 97 cases of tuberculosis in various stages of activity and about two hundred controls. He has found that either the stab cells are increased or the lymphatic elements are decreased in all tuberculous cases and in none of the controls. The blood returns to normal in a few days and a repetition of the test will reproduce the result. Whether the work of Bredeck and others who have reported similarly will stand the test of time remains to be seen, but at least it is worthy of serious consideration by the ophthalmologist desirous of all possible light on the etiology of intraocular inflammations.

Lawrence T. Post.

A NEW SOCIETY OF OPHTHALMOLOGISTS

The Association for Research in Ophthalmology has established its right to the attention of all who are interested in the subject. It has held two interesting and important meetings, has stimulated actual research into the etiology of

uveitis, and has gathered almost two hundred sustaining and active members. This is larger than the membership of the American Ophthalmological Society, founded sixty-eight years ago. Its members are drawn from all parts of the country; and by their previous work in special societies, and their contributions to literature, have proved their interest in research.

The existence of this organization shows the present development of ophthalmology as a special branch of medicine. The American Ophthalmological Society, organized in 1864 started with seven members. It was the first special national society in the world. The first International Ophthalmological Congress had been held in Brussels in 1857; and von Graefe had gathered a few friends for summer meetings, to discuss their interesting experiences, out of which later developed the Heidelberg Congress. But this new association has made progress, never witnessed in such an organization, until these last few years. Its method of concentrating attention for the whole meeting on one definite topic; viewing its different aspects by the explanations of several workers, each of whom has been thinking along his own special line; keeping the general discussions down to definite questions, which the reader can answer, or re-state from his special standpoint, seems to have lifted these meetings out of the usual rut of precedent, and made them attractive to a large number of ophthalmologists.

The plan of meeting just before the American Medical Association, at Detroit and Philadelphia, has yielded good meetings both for numbers and interest. It will doubtless be equally successful at New Orleans; and give a better understanding of some things about which more information is needed; to replace the confusion of partisan statements and unfounded or unjustified assumptions, and claims made for their wares by those who sell glasses to prevent or overcome glare. Basic optics should be better understood by ophthalmologists; and the plans adapted for the meeting of the Association for Research in Ophthalmology should draw a large propor-

tion of those, who go to New Orleans to attend the Section on Ophthalmology, also to attend the meeting held the day before the Section begins its sessions.

The program for the New Orleans session will be found on p. 396 of this issue of this Journal.

Edward Jackson.

BOOK NOTICES

The certification of blindness and the ascertainment of the causes of blindness. Report by the Prevention of Blindness Committee of the Union of Counties Associations for the Blind. Paper covered, 19 pages. Price one shilling.

The Union of Counties Associations of the Blind appointed a standing committee on November 20, 1930, to study the problems of the blind. This is a report of this committee. Exact information was sought following the passing of the Blind Persons Act in 1920, by the provisions of which any person "too blind to perform work for which eye sight is essential" came under the provision of this act. This was superceded by The Local Government Act of March 31, 1930, but the definition of the industrially blind individual was essentially unchanged.

A lack of clarity of definition between blind pensions and old age pensions has worked a hardship on certain individuals. On the other hand the committee has found that there are probably a number of persons enjoying the benefits of the Blind Persons Pension Act who are not entitled to them. The committee recommends that no one be certified as blind until examined by a medical practitioner with special experience in ophthalmology and that a common form of certificate be used. Furthermore the committee suggests that examinations be made at a special clinic designated for the purpose. It is further recommended that a definite visual standard be uniformly enforced: That those having less visual acuity than 3/60 Snellen be regarded as blind but that vision be also tested at one meter. This would constitute group one. Group two, would consist of persons

with visual acuity of 6/60 or better in whom the field of vision was markedly contracted in the greater part of its extent and particularly if the contraction were in the lower part of the field. These also may be considered blind. Group three would include persons with visual acuity of not less than 3/60 Snellen but less than 6/60 who should be regarded as blind if the field of vision was considerably contracted but should not be regarded as blind if the visual defect was of long standing and was unaccompanied by any material contraction of the field of vision.

Illustrative charts are appended.

Lawrence T. Post.

Congreso medico del Centenario, Actas y trabajos (Centenary Medical Congress of Uruguay, proceedings and papers), ophthalmic section, 119 pages, illustrated. v. 5. Published by A. Monteverde y Cia., Montevideo, 1930. No price given.

This volume of the proceedings of the Uruguayan Independence Centenary Medical Congress, which was held in October of 1930, contains the papers of the section of ophthalmology, with the exception of the two official reports which are included in volume II. We learn from A. S. Viana that ophthalmology in Uruguay is relatively young. The first chair of ophthalmology (theoretical) of the Faculty of Medicine was established in 1887, and the chair of Clinical Ophthalmology was only established in 1892. Prof. Isola was the incumbent from the beginning until 1929 when Prof. Vazquez Barriere succeeded him. Frequent attempts to organize an ophthalmological society failed, but there has been one functioning since 1929—the Montevideo Ophthalmological Society. By the law of 1916, only physicians are permitted to examine eyes for glasses, and opticians (who have to be licensed) are prohibited from possessing on their premises either a dark room or instruments for the examination of eyes.

The first official report is that of Barriere on trachoma prevention. He stresses the need of facilitating treat-

ment and of an educational campaign among the people. In the discussion, Lijo Pavia points out the value of slit-lamp microscopy in the differential diagnosis of trachoma as worked out by Dusseldorp, Cuenod, Nataf, and himself, and advocates special schools for the trachomatous.

The second official report is by Enrique Mendez on the Industrial Eye Accidents in Uruguay. This is a statistical study of 6228 eye accidents of the past fifteen years. By a statistical analysis there is found a "significant" difference in favor of the left eye in injuries, 103.1 left eyes being injured to 100 right eyes. More than half of the eye accidents are among unskilled workers, smiths (14 percent), mechanics (14 percent) and stonecutters (7 percent). Foreign bodies constitute 66 percent of all eye accidents. Sympathetic ophthalmia is rare—only four cases. There is a rather high percentage of short circuit ophthalmias (0.72 percent) and of electric welding ophthalmias (0.56 percent). Twelve cases of ocular anthrax occurred. Toxic amblyopias are rare. Certain workers have been found to be repeaters in accidents. In dealing with simulation, three groups are recognized: The malingerers, the exaggerators, and the aggravators—those who prolong their disability artificially. The last group is the most troublesome, and the ophthalmologist is described as defenseless against them. The suggestion is made for the posting of notices to frighten the offenders since there is in Uruguay a law providing for their prosecution. The Workmen's Compensation Law has been in operation since 1920, and an Accident Prevention Law has existed since 1914. Little has been accomplished, it appears, by way of prevention, because of the understaffed Department of Labor.

Lijo Pavia reports a case of retinitis pigmentosa with macular as well as peripheral lesions which responded to liver extract; the improvement being demonstrated by fundus photographs, hesperanometric measurements as devised by the author, and by the study of entoptic observations as practiced by Fortin.

Fortin's paper calls attention to the value of entoptic observation of the fovea to demonstrate the existence of the layer

of retinal capillaries of a uniform caliber of three microns and 100 microns in length, which nourish the internal granular and the internal plexiform layers, and which are invisible ophthalmoscopically and unknown histologically. A uniform diffusely illuminated intense Cooper-Hewitt mercury lamp filtered to eliminate the violet rays by a gelatin filter and emitting rays of 432 millimicrons, is recommended for observing the phenomenon. The whole retina is seen to contain these vessels making pulsatile excursions of 30 microns in amplitude, except the foveal center which has a honeycomb appearance, since it is avascular, and is surrounded by a cobweb-like periphery. The nuclei of these capillaries project into the lumen and help in compressing and expressing the red blood corpuscles, the diameter of which is about seven microns and which are arranged in the form of the classical rouleaux thereby. The external layers of the retina, the layer of rods and cones, the external granular layer and the layer of Henle, are avascular—this, in the opinion of the author, is a provision of nature to protect the receptor elements of the retina from the vibrations of the circulation.

Salaberry reports excellent results from his sodium chloride treatment of trachoma, with 80 percent permanent cures.

Barbot reports three cases of juvenile familial glaucoma without lues.

Berro reports his success with the Salterian treatment of ophthalmia neonatorum, the principal feature of which, it appears, is the careful exclusion from contact with the cornea of the silver nitrate brushing of the conjunctiva.

Argañaraz reports a simplified operation for lacrimonasal fistulization in chronic dacriocystitis. This consists in ablation of caruncle, slitting of both canaliculi and joining them into a continuous groove, puncture of the lower sac and nasal wall with an antrum trochar armed with a special perforated lacrimal canula with flange at upper end. The canula is left in situ on withdrawing the trochar and remains until a permanent fistula is established. It is moved about daily. Thirty successfully operated cases are reported.

Vazquez Barriere reports on two successful Jackson's transplantation opera-

tions for paresis of the superior oblique.

Salaberry and Paiva report two cases of melanosis of the choroid. Chiazaro finds metallic magnesium experimentally introduced into the eye, well tolerated and rapidly absorbed. In another contribution, he points out that the Morax-Axenfeld and the Pettit diplobacilli are not identical. *M. Davidson.*

Courts and Doctors. By Lloyd Paul Stryker. Two hundred thirty-six pages. Cloth, price \$2.00. The Macmillan Company, New York City, 1932.

In this book, the author, having been for many years general counsel for the Medical Society for the State of New York and having had personal charge of the legal policy of the society and the defense of its members who were sued for malpractice, offers advice and counsel that is designed to protect physicians against unwarranted attack upon their professional character.

After lauding the medical profession in the introduction, Mr. Stryker discusses not only malpractice, but also other interesting subjects through which the doctor comes in contact with the courts. The main divisions of the book are entitled; the practice of medicine; the relationship of patient and physician; the action for malpractice; defenses to actions for malpractice; expert testimony, the doctor on the witness stand, and the doctor and the criminal law. In the conclusion there are well-pointed excerpts from the writings of Oliver Wendell Holmes. There is a complete list of cases and references cited, and authorities and abbreviations used. A case is cited where a physician was sued because glaucoma developed after a cataract extraction.

The reviewer considers that the two to three evenings needed to read the book will be very well spent. It will be especially attractive to those who have been sued or who have to testify in court. The language is not too legally technical and the style is happily interesting. This book should be handy for every physician and medical student to read and have for reference.

Ralph W. Danielson.

A survey of Sight Saving Classes in the Public Schools of the United States.

By Edward T. Myers, Ph.D. Paper covered, 105 pages. Price 50 cents. Publication No. 64 of the National Society for the Prevention of Blindness, New York. Reprinted from the April 1930 Sight Saving Exchange.

This is an extremely comprehensive study of the problem of sight saving classes in America. On the date of publication there were then 213 sight saving classes with a total enrollment of approximately 4087 pupils.

The first sight saving class was a "myope" class organized in England in 1907. The first class in America was established in Boston in April 1913. In September of the same year a class was organized in Cleveland.

The distribution of the present classes is largely urban so that the visually handicapped child who lives in the country usually cannot get the benefit of this special schooling.

There are no classes known for the semi-sighted except under the sponsorship of the public schools. Twenty-one states are represented. The percentage of children who ought to be in such classes varies somewhat between one-fifth and one-tenth of one percent. The general health of these children was about that of the average school child. The financial status of the parents was rather below average.

The most frequent eye defects were myopia, 38.9 percent, hyperopia, nystagmus and astigmatism. All but 4.3 percent of the children in these classes who should be wearing glasses were doing so. Over 90 percent of the children who had received two visual tests were found to have the same or better vision at the time of the second test and of these 26.4 percent showed improvement.

Another encouraging feature was that for the most part these children were able to progress normally in their studies. The percentage of these was somewhat lowered by the inclusion in this class of 5.5 percent mentally defective children. It is a well known sociological precept that where an individual has a double handicap the more important handicap should be the gov-

erning factor so that these mentally defective children should have been in classes for mental defectives rather than in sight saving classes where it was impossible to provide both.

This book records a most encouraging step forward and those who have been the instigators and dynamic forces behind this constructive work merit sincere recognition. *Lawrence T. Post.*

Die Röntgendiagnostik und -Therapie in der Augenheilkunde, volume xix of Radiologische Praktika. By Dr. Wolfgang Hoffmann of the Universitäts-Augenlinik in Königsberg i.Pr. 72 pages, 20 illustrations. Georg Thieme, Leipzig, 1932.

Even a hasty glance through this slender volume leaves an impression with the reader, as he turns the leaves and his eye is arrested by the excellent illustrations, the clearly printed page, the lucid German, that here is a good piece of work. This impression is strengthened as the subject matter is studied more closely. The application of the x-ray for diagnosis of ocular affections is treated in twenty-five pages with eleven illustrations, and the important literature on the subject fairly reviewed. A discussion of the well-established use of the x-ray for localizing foreign bodies is given the greatest space, but in a few pages the more recent employment to which it has been put is outlined, such as to reveal diseases of the orbit; for example, bone tumors in which it is necessary to differentiate between the easily operable exostoses from the orbital wall and the more dangerous osteomata from accessory sinuses. By blending hard and soft rays changes in the soft tissues contained in the orbit have been depicted, "hemorrhage, angioma, dermoid, lymphoma, inflammatory pseudo-tumor, in which the picture shows structure, form, extent, and delimitation of the diseased area with surprising clearness." The optic nerve can be shown in relation to the optic canal and its neighboring sphenoid and ethmoid

cells, and the effect of disease upon the size of the optic foramen is convincingly treated. Changes in the lacrimal ducts are also demonstrable.

The section on Roentgenotherapy in ophthalmology is introduced by a frank and full discussion of the injurious effects, both early and late, of the x-ray upon ocular tissues, in inducing cataract, glaucoma, and other pathogenic manifestations, and how these may be avoided by employing adequate protection and regulated dosage. The second half of the book is concerned with an enumeration of the various ocular affections that have been found to yield to x-ray therapy, together with the proper protection and dosage for each. Tuberculosis of the eye and its adnexa is treated at some length, showing what has been done for tuberculosis of the lacrimal passages, conjunctiva, eyeball, and orbit. Chronic inflammations of the eyeball due to other agents are discussed in the next division, such as Mikulicz's disease, in which x-ray is the therapy of choice; uveitis after injury, sympathetic ophthalmia, in which, however, irradiation does not suffice to prevent manifestations in the second eye and should not delay enucleation if rapid improvement after the first dosage does not set in; intraocular hemorrhage after injury, and ulcerous processes in the cornea. Chronic inflammations of the lids and conjunctiva are also shown to be subject to this therapy; for example, blepharitis, granulosis and vernal catarrh. There follows a discussion of the acute inflammations, dacryocystitis, orbital phlegmon, panophthalmia, and keratitis parenchymatosa, in some of which the results have been surprisingly good. Hemorrhagic glaucoma and secondary glaucoma will often yield most gratifyingly if the vascular changes have not progressed too far. New growths of the lids, epibulbar tumors and intraocular tumors both carcinomatous and sarcomatous, cysts of the iris, orbital tumors and new growths of the hypophysis are mentioned with a view to prescribing the utmost that can be done for their relief. *E. S. Buss.*

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

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| 1. General methods of diagnosis | 9. Crystalline lens |
| 2. Therapeutics and operations | 10. Retina and vitreous |
| 3. Physiologic optics, refraction, and color vision | 11. Optic nerve and toxic amblyopias |
| 4. Ocular movements | 12. Visual tracts and centers |
| 5. Conjunctiva | 13. Eyeball and orbit |
| 6. Cornea and sclera | 14. Eyelids and lacrimal apparatus |
| 7. Uveal tract, sympathetic disease, and aqueous humor | 15. Tumors |
| 8. Glaucoma and ocular tension | 16. Injuries |
| | 17. Systemic diseases and parasites |
| | 18. Hygiene, sociology, education, and history |

1. GENERAL METHODS OF DIAGNOSIS

Holzapfel, W. H. **Pupillary reactions in health and in diseases other than ocular.** New York State Jour. of Med., 1931, v. 31, June 15, p. 765.

The author attempts to differentiate certain diseases depending on whether the pupil is dilated and responsive, dilated and sluggish, dilated and fixed, or contracted. *Ralph W. Danielson.*

Surat, W. S. **The so-called scleral and corneal reflexes.** Klin. M. f. Augenh., 1931, v. 87, Nov., p. 645.

Examination of five hundred school children and one hundred healthy adults showed that, while the corneal reflex is very constant, the same stimulation does not elicit the reflex from the episcleral conjunctiva. Closure of the lids upon intense stimulation of the conjunctiva is to be regarded as a voluntary defensive movement, if the sensibility is preserved. In the newborn the reflex upon approaching an object to the eye is lacking, whereas the corneal reflex occurs promptly. The latter is less marked in infants. Slight reflex disturbance in hemiplegia, no disturbance in Parkinson's disease, completely lacking reflex in affections of the peripheral reflex arc (trifacial-facial),

permit us to speak of a brainstem-reflex arc which is supplemented by the sensoromotor part of the cerebral cortex, and to deny closure of the reflex arc in the subcortical ganglia as assumed by some writers.

C. Zimmermann.

2. THERAPEUTICS AND OPERATIONS

Bietti, G. **The effect upon the eye of parenteral introduction of urine and related substances which tend to lower blood pressure.** Klin. M. f. Augenh., 1931, v. 87, Nov., p. 618. (Ill.)

Intravenous injections of urine of the same animal, other rabbits, and man; or of callicrein or prolan (constituents of the urine) produced identical histological changes in the eyes of rabbits. Edema of the ciliary processes was present with vesicular detachment of the ciliary epithelium. The bloodvessels, especially of the ciliary body, were overloaded with blood, and extravasations and diapedesis were observed from toxic action, with red and white blood corpuscles in the lower sinus of the anterior chamber. In the vascular walls were monocytoïdes and lymphocytes. Callicrein and prolan were more effective than the native urine. With these observations the cir-

cle of irritants has been widened, which after parenteral introduction produce similar reactions in the uvea.

C. Zimmermann.

Camison, A. **Value of preoperative bacteriological study of the conjunctiva.** Arch. de Oft. Hisp.-Amer., 1931, v. 31, Oct., p. 562.

Smears when negative are considered valueless as prophylaxis against infection. The Elschnig-Ulbrich procedure has been found reliable and simple.

M. Davidson.

Carreras, B. **Iridectomy ab externo.** Arch. de Oft. Hisp.-Amer., 1931, v. 31, Sept., p. 481.

Since 1927 iridectomies only ab externo have been practised by the writer, following the technique of Elschnig. The method was found of great advantage even in optic iridectomy.

M. Davidson.

Kasas, I. I. **Shall we confine ourselves to bismuth in the treatment of ocular syphilis?** Archiv Oftalmologii, 1931, v. 8, no. 3-5, p. 267.

From the use of bismuth alone in the treatment of ocular syphilis, the author encountered undesirable complications such as attacks of iritis and scleritis—as well as an aggravation of the existing corneal or optic nerve lesions. Kasas advises, as a routine procedure, an initial course of mercury and iodides, followed first by the administration of neosalvarsan and then by a course of bismuth. No provocative ocular reactions were observed when this plan of antisiphilitic treatment was carried out.

M. Beigelman.

Krasso, Ilona. **Border-ray therapy of acute and chronic catarrhal conjunctivitis.** Zeit. f. Augenh., 1931, v. 75, Nov., p. 285.

In the spectrum of electromagnetic waves, those wavelengths that lie between the roentgen rays and ultraviolet light are relatively harmless. Unlike the roentgen rays they have not induced cataract in experimental animals. In thirteen or fourteen cases of

acute conjunctivitis one exposure to these rays quickly caused subjective symptoms to disappear, and the course of healing was shortened. Of thirteen cases of chronic conjunctivitis with organisms demonstrable in the secretion, eleven were made symptomless. Twenty-seven cases of chronic conjunctivitis of two to four years' standing with no organisms demonstrable in the exudate were irradiated. Eleven of these were promptly made symptomless, and in five there was objective improvement. The shorter the duration of the disease the better are the chances of recovery.

F. Herbert Haessler.

Lidström, A. E. **On the treatment of eye diseases with Malmstrom's oil extract.** Acta Ophth., 1931, v. 9, p. 316.

In a number of eye diseases the author used subconjunctivally Malmstrom's oil extract (a water soluble product generated in the process of irradiating cod-liver oil) neutralized with sodium hydroxide. It had no effect on diseases of the choroid and retina, but acted favorably in iridocyclitis, particularly of the acute type, in episcleritis, in scleritis, and in sclerokeratitis. It acts by increasing oxidation, and its anodyne effect is very pronounced.

Ray K. Daily.

Lukovsky, S. A. **The prophylaxis of postoperative complications.** Archiv Oftalmologii, 1931, v. 8, p. 289.

During the year 1929, various antiseptic agents (collargol, mercury cyanide, silver nitrate, optochin, and yellow oxide of mercury) were used in the preparation of cases for intraocular surgery. There were three cases of purulent infection among the 177 cases operated upon. In the year 1930 the prophylaxis consisted of optochin and rivanol only, the latter used in a 1:500 solution. There was no destructive infection among the 330 operative cases. The author attributes these results to the use of rivanol, which also has the advantage of being nonirritating to the eyeball even in a 1 to 100 solution.

M. Beigelman.

Treigny, Merigot de. **Reflections on the use of high frequency in ophthalmology**, *Ann. d'Ocul.*, 1931, v. 168, Dec., pp. 972-979.

After an interval of four years the author writes again that he is convinced that high frequency is a therapeutic agent of the first order but by no means a cure-all. The chief indication is for destruction; treating neoplasms of all kinds, also to ameliorate cicatrices and for marginal chalazia. As for medical diathermy the author is not enthusiastic in that the courses of treatment are long and each individual treatment lasts one-half hour. Conditions in which hemorrhage is apt to occur contraindicate its use.

H. Rommel Hildreth.

3. PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Fischer, F. P., and von Hofe, K. **The electrical stimulation of the human eye during light absorption**, *Arch. f. Augenh.*, 1932, v. 105, pp. 442-452.

Using the method of Achelis and Merkulow, Fischer and von Hofe determined the sensitiveness to electrical stimulation of the human eye adapted to strong light. After exposure to brilliant light there was increase in the stimulus needed and in the reaction time. This corresponds with the results obtained in the dark adapted eye. The authors feel they are not dealing with a purely photochemical change in the retina but also with a complicated central nervous system component.

Frederick C. Cordes.

Jackson, E. **Norms of refraction**, *Jour. Amer. Med. Assoc.*, 1932, v. 98, Jan. 9, p. 132.

This paper is a collection, from private case records of thirty years, of data bearing on the norms for emmetropia, hyperopia, myopia, and regular astigmatism. The average spherical refraction was obtained as an average of the two principal meridians of regular astigmatism. Over eight thousand cases were studied; eyes damaged by disease and trauma were not included.

The cases are analyzed thoroughly as to kind and amount of refractive error, extremes and averages, and age incidence. The statistics were found not to give any certain support to the hypothesis that all infants' eyes present at first a hyperopia, which generally decreases during childhood and youth. Hyperopia decreases in amount up to the age of twenty years, after which there is a slow increase up to old age. Myopia is rare in childhood, and the average amount tends to increase especially after twenty years. (Discussion, four tables.) *George H. Stine.*

Krakov, S. W. **The differences of sensitivity in the peripheral retina for twilight vision**, *Graefe's Arch.*, 1931, v. 127, pt. 1, pp. 86-99.

The peripheral points on the retina that were examined (7° , 11.5° , and 26° nasally and temporally from the fovea) showed under conditions of twilight vision a considerably lower differential sensitivity in comparison with that of daylight vision. The difference in sensitivity of twilight vision decreases with increasing eccentricity of the stimulated point on the retina.

The degree of retinal self-illumination computed according to Helmholtz' method on the basis of the experimental data grows less and less from center toward periphery. Contrary to differential sensitivity which constantly decreases toward the periphery, the absolute light sensitivity of twilight vision has a marked maximal value at an eccentricity of 11.5° degrees. The differential sensitivity of twilight vision increases with the dark adaptation of the eye. (Formulas.)

E. S. Buss.

Kronfeld, P. C., and Devney, C. **Contribution to our knowledge of the curve of refraction**, *Graefe's Arch.*, 1931, v. 126, pt. 4, pp. 487-501.

A refraction curve was constructed from clinical material of 2229 eyes, skiascoped under atropin, and presenting an astigmatism of not more than 0.5 diopter, in patients ranging in age from twenty-five to fifty years. This

curve differed from that published by Scheerer-Betsch in that it contained relatively more eyes requiring -2 to -4 . If the myopic side of the curve were corrected corresponding to Scheerer's figures (without excluding eyes that had conus) an almost symmetrical curve would result. The obliquity was $+0.31$, and might be attributed to anlage factors as well as to extraneous ones.

The chief difference between the human curve of refraction and the binomial approximation is the great excess of the former, brought about by the presence of too many eyes having extreme deviation, at both ends of the curve and by the accumulation of relatively too many eyes near the mid value of refraction. The former phenomenon is explained by the presence of several genotypes, the latter by the noticeable correlation between refractive power and length of axis, proofs of which have been presented by Straub, Zeemann, and Tron. Steiger's theory of free and independent combinations of axial length and refractive power must therefore be modified accordingly.

E. S. Buss.

Metzger, E. **Experimental investigations of light tonus in man and the rabbit. (A contribution to the problem of optic orientation.)** Graefe's Arch., 1931, v. 127, pp. 298-346.

The author defines light tonus as a physiological process, the expression of the optical apparatus of equilibrium, in which the exciting form of energy is the visible radiation of the spectrum and the receiving sensory surface is the retina plus the higher optical centers. The results of the author's experiments show that in man, as in the rabbit, when one eye is illuminated there occurs an elevation of tonus recognizable in the tendency to fall, in the elevation of brachial tonus, and in past pointing. Within the visible spectrum, long-wave rays have a lower tonus valence than have short-wave rays of equal subjective brightness. If both retinal halves are stimulated simultaneously

with complementary lights, changes of tonus take place in the static apparatus, and these become reversed with reversal of the stimulating conditions.

The light reactions of lower organisms, representing the basic processes of optic orientation in space, closely correspond to the expressions of light tonus in man and rabbit. The theory of light tonus as an equilibrium process in the sensoromotor apparatus corresponds to the theory which earlier investigators (Jacques Loeb and others) formed from their photobiologic investigations. Wherever there seem to be differences, these are based upon the organization of the photoreceptors and the contractive substance.

E. S. Buss.

Much, V. **Contact lenses.** Arch. f. Augenh., 1932, v. 105, pp. 390-414.

In an introduction to a series of articles, Much gives a résumé of the literature on the history of contact lenses.

Frederick C. Cordes.

Much, Viktor. **The present status and possibilities of contact glasses.** Acta Ophth., 1931, v. 9, p. 249.

Contact glasses, used originally in keratoconus and irregular corneal astigmatism, have been tried recently in various conditions such as refractive errors, cicatricial corneal astigmatism, pannus, and other inflammations of cornea and lids. In keratoconus contact glasses not only have an optical effect, permitting occupational usefulness, but exert an orthopedic action, which has a therapeutic value. This effect is illustrated with the report of two cases, in which there was a subjective and objective improvement after five weeks' use of contact glasses. In corneal astigmatism contact glasses are the only means of obtaining clear vision, but in these cases there is frequently a diminished corneal sensibility, which makes the eye unusually tolerant of these glasses. In trichiasis the symptoms are immediately relieved by introduction of a contact glass, and

their good effect in pannus may be due partially to elimination of the accompanying trichiasis. In marginal dystrophy of the cornea, the results are not very satisfactory, because the disease usually occurs in aged people, whose cooperation is very difficult to obtain. In recurrent corneal erosions and corneal herpes the daily use of an umbral contact glass will effect a cure, and the treatment may be supplemented by the use of a salve between cornea and glass. Contact glasses are suggested to prevent symblepharon after burns. In ulcerus serpens the author used the contact glass for a prolonged application of optochin or collargol salve to the cornea. In iritis and parenchymatous keratitis an umbral contact glass relieves the intense photophobia and reduces the intraocular tension present in some cases; the tolerance to these glasses in iritis varies, and for this reason they cannot be used in some patients, however favorable their effect. In very high myopia a combination of a contact glass with a weak concave lens gives better vision than very strong concave lenses. With moderate myopia in such people as actors, flyers, soldiers, and sailors, contact glasses may sometimes be preferable to lenses. Unilateral aphakia with the fellow eye normal may be corrected with a contact glass. Umbral contact glasses relieve the photophobia of albinism and aniridia. Corneal transplants do particularly well under contact glasses.

Ray K. Daily.

Prangen, A. de H. **Subnormal accommodation.** Arch. of Ophth., 1931, v. 6, Dec., pp. 906-920.

Subnormal accommodation is frequently overlooked in the average examination for refraction. Duane placed the incidence of subnormal accommodation at five percent of all refractive cases. He divided such insufficiency into two main groups: First, static, that is, a condition of inertia; second, dynamic, innervational, a condition of deficient energy (a) with pupillary involvement or (b) without

such involvement. The author's interest is chiefly centered upon this last group, reporting fourteen under the second subdivision; though he notes three cases in group one and three in the first subdivision of group two.

Cases of inertia or premature presbyopia should be recognized and be given additional help for close work. Those of dynamic accommodative insufficiency with pupillary involvement are considered as cases of unilateral ophthalmoparesis. The last group are more fugitive, show no pupillary change, are easily overlooked, and yet are associated with more intense symptoms. Asthenic persons deficient in reserve of nervous energy are those most likely to suffer from dynamic subnormal accommodation, though occasionally the condition may suddenly afflict robust persons. The pathology is obscure. Dental infection has played a large part in the author's cases and seems to him a major cause. The disturbance may manifest itself as an actual, constant reduction in accommodative power, or as an inability to sustain the act of accommodation. In many of these cases fixation of the near point at from 25 to 33 cm. from the eyes without range appears to be pathognomonic of accommodative asthenia. Treatment should be directed toward correction of any general physical cause, or elimination of any focus of infection, and, if necessary, plus lenses should be added for near work.

M. H. Post.

Roche, Charles. **Optical iridectomy should be an operation of exception.** Arch. d'Opht. 1931, v. 48, Dec., p. 825.

This article is a plea for the more careful selection of cases for optical iridectomy. Attention is called to the frequently disappointing results of this operation, which may be due to corneal scars being absorbed beyond expectation, or to interference of the operated eye with the vision in the other eye where this is normal. One should be certain that the cornea is permanently scarred before making an arti-

ficial pupil. Otherwise dazzling and confusion may be the result. In three cases reported results were unfavorable because the above precautions were neglected.

M. F. Weymann.

Sanna, Giuseppe. **Visual behavior in regular astigmatism.** *Arch. di Ottal.*, 1931, v. 38, May-June, p. 254.

This article contains a very comprehensive study of the influence of various forms of astigmatism upon visual acuity, also a detailed description of physiological and physical problems encountered in the correction of astigmatic errors. The main factors influencing visual acuity are as follows: (1) pupillary size, (2) state of accommodation, (3) monochromatic aberration of the refractive beam in the eye, and (4) asymmetry of the refractive beam in the eye.

David Alperin.

Stillson, Hamilton. **The psychology of vision.** *Northwest Med.*, 1931, v. 30, Aug., p. 368.

The author has assembled a group of statements from various writers on psychology.

M. E. Marcove.

Stutterheim, N. A. **The convergence of human binocular vision.** *Brit. Jour. Ophth.*, 1932, v. 16, Jan., p. 20.

In this contribution the author submits a new principle of binocular vision. It appears that some serious confusion exists in the terms and definitions of binocular ophthalmology. One of the causes of this condition is the overlapping of ophthalmological science with mechanics or optics on the one hand (on account of the ocular media) and with psychology on the other hand (on account of the visual fields in the cortex cerebri).

Fusion of the two ocular images is a psychological phenomenon. Experimental investigation has proved that there is no actual fusion, either in an optical or in a physiological sense. The ophthalmologist, therefore, should avoid using the word fusion in the terms describing binocular movements. Such terms as fusion range, fusion movements, and fusion compulsion,

wrongly suggest physiological relations. Not fusion but reflex convergence—a measurable function and not a psychological phenomenon—is responsible for bringing together the two foveal images. For physiological reasons one should speak of direction and not position.

The point is that all these motor coordinations are performed by the function of involuntary convergence. The degree to which a person by his or her involuntary convergence is able to overcome the action of the prism varies. That degree is the measure of such a person's power of involuntary convergence.

D. F. Harbridge.

Stutterheim, N. A. **Curable eyestrain.** *Jour. of Med. Assoc. of South Africa*, 1931, v. 5, Aug., p. 522.

The author believes that involuntary convergence is the true cause of eyestrain. After testing for the various phorias, the abducting and adducting power are determined. Prism exercises to build up the offending muscles are given over a long period of time.

M. E. Marcove.

Tron, C. **Curvature myopia.** *Russkii Ophth. Jour.*, 1931, v. 14, July, p. 11.

One hundred and twenty cases of myopia were subjected to a thorough optical study, including an investigation of the corneal refraction, of the lenticular curvatures, and of the axial length. In three cases the length of the axis was within emmetropic limits—from 20.46 to 25.46 mm. The ophthalmometer revealed in these three cases an increased curvature of the lens surfaces. According to Tron, these were cases of globophakia (spherical lens).

M. Beigelman.

Wibaut, F. **Statistical investigation of the heredity of refractive conditions.** *Arch. f. Augenh.*, 1932, v. 105, pp. 209-289.

Wibaut made an extensive study of the relation of heredity to refractive conditions. Astigmatism in a child is not always the result of inheriting the astigmatism of the parents, but may

arise through a marked difference between the refractive indexes of the corneas of the parents. The refractive index of the parents and child shows such a correlation that it may be regarded as hereditary. The author also concludes that, in children, hyperopia need not be more frequently or more fully corrected than symptoms require. In the development of myopia, particularly the milder forms, near work is an important factor and should be controlled.

Frederick C. Cordes.

4. OCULAR MOVEMENTS

Bartels, Martin. Miners' nystagmus in England and Germany and its influence on industrial efficiency. *Zeit. f. Augenh.*, 1931, v. 76, Dec., p. 29.

Miners' nystagmus is a typical industrial disease. In judging the degree of compensability one must be guided by the objective symptoms. The findings of the general medical examination must also be taken into account in determining a man's ability to work. A condition of all compensation should be withdrawal from underground work. To avoid immediately depriving a man of his job, it has been possible in many cases in England to relieve the disease or habituate the man to the disability by transferring him to other levels.

F. Herbert Haessler.

Colrat, A. Bilateral paralysis of lateral motion in both eyes, of congenital origin. *Arch. d'Opht.*, 1931, v. 48, Dec., p. 822.

A child of two and a half years was noticed to have a slight internal strabismus with almost normal vertical movements of the eyes, but complete absence of any lateral rotation. Shortly after birth the vertical movements had also been lacking, but these had gradually developed until they were about normal. The fundi were normal and there were no other pathological neurological findings.

The writer is at a loss to explain the location of the lesion or its etiology, but he was unable to rule out syphilis. Slight movements of converg-

ence were present, but no mention is made as to whether or not the eyes could be rotated laterally with forceps.

M. F. Weymann.

Fawcett, K. R. Extraocular muscle paralysis following spinal anesthesia. *Minnesota Med.*, 1931, v. 14, July, p. 648.

Fawcett reviews the literature and reports two cases. One cleared up entirely within two weeks, but the other still has a marked convergent strabismus after eighteen months. The author's conclusions are: (1) Extraocular muscle paralysis is a rare complication of spinal anesthesia, but must nevertheless be kept in mind constantly by the surgeon and ophthalmologist. (2) The etiology has not yet been definitely established. (3) The interval after which symptoms appear varies from three days to three weeks. (4) In a large majority of cases the symptoms clear up spontaneously within three weeks. (5) The treatment should be extremely conservative, and muscle operation should certainly not be resorted to under eighteen months. (References.)

Ralph W. Danielson.

Mueller, Egon. Remarks on the problems of strabismus and of amblyopia without ophthalmoscopic findings. *Zeit. f. Augenh.*, 1931, v. 75, Nov., p. 354.

The author's discussion of the strabismus problem concerns itself chiefly with hypotheses as to its mechanism. Since we know of no other malformation that occurs with such frequency (two percent) the assumption obtrudes itself that we are dealing with the biologic variations of a functional unit. Faulty fusion faculty cannot explain the anomalous position of the eyes, since it merely makes possible the development of strabismus. It is an error of the older theories to consider the faulty position of the eyes as the basic lesion. Strabismus results from inability of an adequate perceptive system to perceive two normal images simultaneously.

F. Herbert Haessler.

O'Connor, Roderic. **The cinch shortening loop in surgery of the extraocular muscles.** West. Jour. of Surg., Obstet., and Gyn., 1931, v. 39, Sept., p. 670.

In this paper the author gives in detail the advantages and the technique of the cinch operation of the extraocular muscles. (Discussion.)

M. E. Marcove.

Perez Cirera, R. **The curve of the electric current due to tissue activity as noted in the extraocular muscles under stimulation.** Arch. f. Augenh., 1932, v. 105, pp. 453-459.

Perez Cirera gives the results of his study of the curve of electric current generated by the tissue activity of the extraocular muscles. Rotation with the production of nystagmus was the stimulation used. The author also discusses his theory of the physiology of nystagmus.

Frederick C. Cordes.

Reitsch, W. **Supercilium and pars orbitalis palpebrae superioris in and their significance for the individual eye.** Zeit. f. Augenh., 1931, v. 76, Dec., p. 61.

The author presents a very detailed description of the normal appearance and variations of these parts. Like the author's earlier paper on the lid slit, this essay does not lend itself to condensation.

F. Herbert Haessler.

Roche, W. J. **Miners' nystagmus.** Brit. Med. Jour., 1931, July 11, p. 55. (See also Amer. Jour. of Ophth., 1931, v. 14, Aug., p. 844.)

This paper is a report of research, and favors the theory that defective illumination is the major factor in the causation of miners' nystagmus. Specific recommendations are given.

(The author refers the reader to his article on the same subject in the April number of the British Journal of Ophthalmology.)

Ralph W. Danielson.

5. CONJUNCTIVA

Addario, Carmello. **The mechanical-vaccinal therapy of trachoma and its corneal complications (in the light of**

new anatomical, bacteriological, and clinical criteria), documented by forty-five clinical observations. Ann. di Ottal., 1931, v. 59, July, p. 600; and Aug., p. 687.

Since the demonstration, at the International Ophthalmological Congress held in Holland in 1927, of the widespread incidence of trachoma, and following this the findings of Olitsky as presented at the Geneva meeting of the International League for the Control of Trachoma, the study of this malady has received a new impetus. In many clinics efforts have been made to verify Noguchi's findings. A number of investigators have reproduced the Noguchi phenomena in animals. The author reviews in these articles experiments that have been made up to the present time, and accepts unqualifiedly the Bacterium granulosis as the provocative agent. Having satisfied himself on this point he had a vaccine made by Professor Tallo of the Palermo Laboratory from trachomatous material obtained from clinical cases chosen by Addario. It had already been shown that tears would serve as a vehicle for conveying infection, and Olitsky had infected monkeys from material expressed by friction. The bacillus is found not only in the intercellular spaces of the conjunctiva but also in the interior of the granules. It had been previously established by Addario that Bacterium granulosis had two spheres of action, one superficial, one deep. In the more superficial one the organism was found in the conjunctiva and corneal epithelium; in the deeper it was within the trachomatous granules. The latter consist of numerous extremely minute, granulated, infective neoplasms, penetrated by the specific bacterium and manifested by a chronic conjunctivitis which is reactivated by the toxins given off by the bacteria.

The conjunctivitis and keratitis rarely require mechanical interference but respond to the bactericidal action of the vaccine, while in the infected cases the granules must be squeezed or mechanically removed in order to get a rapid recovery. The earlier experiments

of the author made with his vaccine were unsatisfactory. The reaction was severe and it was difficult to keep the patients under treatment. Later vaccines, however, were more effective and less irritating.

The vaccine is applied directly to the conjunctival sac in a lanoline medium. Considerable reaction follows, with improvement in the more superficial tissues in a proportion of the cases. The granules, however, are often left uninfluenced. These granular bodies are transparent, whitish, or turbid, and nonvascular, and the bacillus is reached only after they are broken down. The author therefore combines with the vaccine the mechanical measure of squeezing or expressing the granules, and sometimes uses irritants such as silver nitrate or copper sulphate. By the use of his specific vaccine together with mechanical and medicinal treatment, cures were effected in from twenty to thirty days. He reports in detail forty-five cases illustrating the value of his methods. *Park Lewis.*

Belot, R. Critical study of the trachomatous intradermal reaction of Tricoire, based on 511 cases. *Rev. Internat. du Trachôme*, 1931, v. 8, Oct., p. 225.

Belot has applied the intradermal reaction of Tricoire to 400 trachomatous and to 111 nontrachomatous individuals, these latter suffering from various nonspecific conjunctival disorders. In the trachomatous cases fifty-nine percent of positive reactions were obtained while in the nontrachomatous the percentage was forty-three. The author is inclined to think that the test has no practical value and believes that his results would tend to show that trachoma is an essentially local disease without participation of the body as a whole. *Phillips Thygeson.*

Blatt, N. The unitarian and dualistic conceptions of trachoma in daily practice, in the statistics, and in the prophylaxis of trachoma. *Graefe's Arch.*, 1931, v. 127, pp. 432-457.

Blatt believes that there may be an acute beginning of trachoma in the ab-

sence of a mixed infection and of pathogenic organisms, which will develop pannus under the very eyes of the ophthalmologist as he follows the case from day to day. The author has shown histological evidence that the initial stages of trachoma establish themselves in Kraus's accessory lacrimal glands and in Henle's acinotarsal glands, becoming manifest in the form of pericanaliculitis and periglandulitis. The plica semilunaris is often affected at the beginning of trachoma.

E. S. Buss.

Caocci, G. Epithelial xerosis of the conjunctiva. *Arch. di Ottal.*, 1931, v. 38, Oct., p. 528.

In a man of sixty-two years, a characteristic patch developed in the bulbar conjunctiva of one eye after a blow. It was of a whitish color and seemed to be covered with an oily substance over which the tears flowed without moistening it. The removal of the mass was followed by no recurrence. Bacteriologically a great number of xerosis bacilli were present. Microscopic examination demonstrated marked change in the conjunctival layers, the middle layer about four times its normal thickness while the elastic layer had degenerated into amorphous cells. The author concludes that the initial injury had lowered the resistance of the tissues and permitted the development of the xerosis bacilli in a dystrophic area. (Bibliography.)

Park Lewis.

Hartson, Montagu. Ultraviolet-ray treatment of trachoma. *Brit. Jour. Ophth.*, 1931, v. 15, Dec., p. 717.

The author emphasizes the use of the open-tungsten-arc lamp rather than the mercury-vapor lamp. The latter is less reliable. A 6 to 10 ampere lamp is used at intervals of three days. One drop of a one percent solution of adrenalin is instilled in the eye to reduce congestion. The patient is seated opposite the lamp at a distance of three feet with the eyelids gently closed. Each eye is irradiated for a period of from two or three minutes. The method is

pleasant, rapid, and definitely curative. The reporter successfully treated over two hundred cases. *D. F. Harbridge.*

Hester, J. H. **Trachoma.** *Physical Therapeutics*, 1931, v. 49, July, p. 299.

After a general discussion of the history and diagnosis of trachoma, Hester gives rather a detailed résumé of methods of treatment that have been recommended. Considerable space is allocated to forms of physiotherapy. The author's method of using diathermy is as follows: Ten percent cocaine solution is applied as an anesthetic. Using a "cold spark," and beginning with low milliamperage so as not to cause pain, the attempt is made to remove all the granulations from one eye at the first sitting; after two or three days the other eye being desiccated.

Ralph W. Danielson.

Junès, E. **Note on the results of the antitrachomatous campaign carried on in the schools of Sfax (Tunisia) from 1929 to 1931.** *Rev. Internat. du Trachôme*, 1931, v. 8, Oct., p. 230.

Junès describes the striking results obtained in the schools of Sfax by thorough medical examination and treatment of pupils. For example, in the French schools the incidence of active trachoma at the commencement of the school year of 1929 was 25 percent. At the end of the school year this had dropped to 4 percent. At the onset of the school year of 1930 the percentage was 7.5 and at the end 3. In the Franco-Arabic schools the results obtained were less striking, the percentage dropping from 50 to 33 the first year and from 35 to 25 the second year. The campaign also appeared to have a favorable effect in diminishing the other ocular infections, usual companions of trachoma, such as the acute conjunctivides. During both years the usual epidemic of Koch-Weeks conjunctivitis was averted.

The author concludes that the beneficial effects of such a program are not limited to the schools but involve the general population.

Phillips Thygeson.

Lehrfeld, Louis. **Vernal conjunctivitis.** *Jour. of Allergy*, 1931, v. 2, July, p. 328.

This is a report of the study of seventy cases of vernal conjunctivitis. Lehrfeld discusses the types, the age and seasonal incidence, and the views of various authors regarding the etiology. Two patients, who had vernal conjunctivitis only in the summer, were tested by placing pollens to which they were sensitive in the conjunctival sac during the winter and getting the clinical symptoms of the disease. The same pollens were instilled in nonsensitive patients with negative results. A report from a section of tissue from the lid is given in detail, the eosinophiles being the predominant feature.

As to treatment the author says that radium will give relief from symptoms, will reduce the extent of the pathologic lesions, but will not cure the disease.

Based on the fact that calcium deficiency has been found to exist in patients sensitive to proteins, calcium gluconate, in ninety grain doses three times a day, one-half hour before meals, was given to each of ten patients during the summer of 1930. The patients reported marked relief from itching. (References and discussion.)

Ralph W. Danielson.

Lobeck, Erich. **Pneumococcal infections of the eye.** *Graefe's Arch.*, 1931, v. 127, pp. 395-400.

In 7 cases of simple pneumococcal conjunctivitis (14 eyes) an avirulent type 4 organism was found eight times, and the virulent form of this type only twice; type 3 but once.

In 12 cases of blennorrhea of the lacrimal sac (13 eyes) two types of pneumococcus were found; virulent type 4 eight times, and type 3 four times; avirulent type 4 once.

In 9 cases of *ulcus serpens* (9 eyes) 3 types of pneumococcus were found: type 1 occurred once (this has not heretofore been reported in the literature); type 3 three times; and the virulent type 4 four times; the avirulent type 4 once.

The sputum finding usually agreed in type with that in the eye. The unaffected eye consistently contained the virulent form of organism less frequently than the affected eye, and quite often was found to be sterile.

E. S. Buss.

Marín Amat, M. **General treatment of conjunctivitis.** Arch. de Oft. Hisp.-Amer., 1931, v. 31, Sept., p. 504.

The whole subject of treatment of conjunctivitis is reviewed. Attention is called to overtreatment by silver nitrate, the necessity of gradually reducing the strength used in acute conjunctivitis as secretion diminishes, and the danger of argyrosis from silver salts in chronic conjunctivitis. *M. Davidson.*

Mendoza, R. **Treatment of relapsing pterygium.** Arch. de Oft. Hisp.-Amer., 1931, v. 31, Oct., p. 572.

Starting from the theory that relapses result from operative procedures which cause an overriding of cornea by sliding conjunctiva, the writer anchors the pterygium in the episcleral tissue after undermining it, and allows the defect to fill up by proliferation. A loose conjunctival suture to promote cicatrization is sometimes used. One of the advantages pointed out is the saving of conjunctiva which has already been excessively sacrificed by the previous operations. The method is also recommended as a primary operation of choice. *M. Davidson.*

Raverdino, E. **Plasmocytoma of the conjunctiva.** Arch. di Ottal., 1931, v. 38, Oct., p. 545.

The author describes a case involving the superior tarsal surface of one lid in a girl of nineteen years whose parents were luetic. While the several tests were negative the possibility of a general pathological basis could not be ignored. The peculiarity was the rapidity of the growth. Microscopic examination presented a multitude of the cellular elements known as plasma cells after the designation of Unna and Marschalk. (Plates, bibliography.)

Park Lewis.

Tirelli, Gaspare. **Pneumococcus conjunctivitis with ulceration of the conjunctiva.** Arch. di Ottal., 1931, v. 38, May-June, p. 243.

The author states that four types of pneumococci are usually found in the normal conjunctiva. He differentiates pneumococcal infection from streptococcal in that the former is very sensitive to optochin medication even in 1 to 500,000 solution, and that edema of the ciliary border of the eyelid is a characteristic manifestation of the former disease. *David Alperin.*

6. CORNEA AND SCLERA

Addario, Carmello. **The mechanical-vaccinal therapy of trachoma and its corneal complications (in the light of new anatomical, bacteriological, and clinical criteria), documented by forty-five clinical observations.** Ann. di Ottal., 1931, v. 59, July, p. 600; and Aug., p. 687. (See Section 5, Conjunctiva.)

Blaickner, Josef. **Clinical experience in the treatment of ulcus serpens.** Zeit. f. Augenh., 1931, v. 75, Nov., p. 304.

Most cases of serpent ulcer are due to type 4 pneumococcus infection. Pneumococci contain an enzyme which is lytic for heat-killed pneumococcus. The latter fact particularly may be important in the heat treatment of serpent ulcer.

Small ulcers with small hypopyon the author treats only with optochin. If the tear sac is infected he extirpates it. If the ulcer progresses or if from the beginning a semilunar pocket exists under Bowman's membrane, he cauterizes with electrocautery to destroy only superficial tissue and thereby to lay open the pocket. Optochin is applied in one percent solution every two hours day and night, and between instillations the eye is filled with optochin and mercury oxycyanide ointment. For large hypopyon he performs an ample paracentesis at the limbus with a broad keratome. Under no circumstances does he apply a bandage. It transforms the eye into an incubator for the pneumococcus. Where protec-

tion is needed he uses a Fuchs wire screen.

F. Herbert Haessler.

Butler, T. H. **Two corneal conditions: 1, acute conical cornea; 2, keratoconus posticus circumscriptus.** Brit. Jour. Ophth., 1932, v. 16, Jan., p. 30.

Butler observed a patient with a foreign body in his left eye. Neither cornea showed evidence of conicity. Returning two years later he had a fully developed conical cornea of the right eye. The slit-lamp revealed that the conical cornea had nothing in common with the orthodox variety. The cornea was enormously thickened at the apex. Just under the epithelium were large cavities. In the region of Descemet's membrane was a large bleb. The left cornea had superficial opacities in the region of which the cornea was thin, the whole cornea being irregular in thickness. About eight months later the right corneal thickening and the spaces under the epithelium had disappeared.

The author's second case, which he diagnosed as keratoconus posticus, was observed in a male aged twenty-nine years. The condition was characterized by a perfectly regular, geometrically precise increase in the curvature of the posterior surface of the cornea, giving a cornea much thinner in the center than at the periphery. (Four illustrations.)

D. F. Harbridge.

Cuénod, and Nataf, Roger. **Biomicroscopy in early trichomatous pannus.** Arch. d'Ophth., 1931, v. 48, Nov., p. 737.

By means of a color plate the difference in biomicroscopic appearance between a normal limbus and one with beginning trichomatous change is illustrated. In making a differential diagnosis certain definite lesions may be found with the biomicroscope before they are otherwise discernible. These changes occur in the cornea at the upper limbus. First the common granite-like stippling of the cornea gives way to an appearance of clotlike opacity. Fine capillaries from the limbus extend out beyond the normal palisade system

in irregular branches. The extension of each capillary is preceded by a lymphatic extension. Between the capillaries small vascularized trichomatous follicles may be seen to build up. In later stages these break down into ulcers and finally they form the marginal facets of Bonnet or Herbert. This appears to be an important method in the early diagnosis of trachoma.

M. F. Weymann.

Hilgartner, H. L. **A preliminary report of twenty-three cases of corneal opacity treated with surgery and radium.** Southern Med. Jour., 1931, v. 34, July, p. 574.

Twenty-three cases of marked corneal opacity are reported in which surgery and radium were used to improve vision. In all of these cases the vision was limited to hand movements, and all were considered hopeless.

A crucial incision is made in the cornea as deep as possible without penetrating into the anterior chamber. The four sections are dissected carefully to the limbus and removed. The cornea is then allowed to regenerate. This occurs in from seven to ten days as a rule. In combination with this, radium treatments are given weekly for three weeks, then every third week, 10 mg. of radium element being passed to and fro 1 or 2 mm. from the cornea. For the first three treatments the dose is three, four, and five minutes, for subsequent treatments five minutes. Three percent cocaine is used as an anesthetic and silver-plated lid retractors are used to protect the lids. Although the results obtained were not startling they did show a definite improvement in desperate cases in which there was no hope of gain by any other method. (Discussion.)

M. E. Marcove.

Jasinski, M. **New chemical procedure for staining corneal leucomas.** Bull. Soc. Franç. d'Ophth., 1930, p. 151.

After experimenting with various compounds on the rabbit's cornea Jasinski concludes that the metallic salts $PbH_2C_2O_4$, $AgNO_3$, Fe_4Cl_6 , and $CuSO_4$ are the most useful compounds for

staining leucomas. These salts combined with certain sulphur compounds (H_2S , Na_2S , Na_2S_2 , Na_2S_3 , and $K_2S_2O_7$) produce excellent staining which has decided permanence. It is also possible to vary the color from brown to black according to the concentration of the solution.

The following technique is employed. The cornea is anesthetized with instillations of five percent cocaine. The epithelium over the leucoma is lightly excoriated with a cataract knife. The scarified surface is then gently rubbed with a solution of the chosen salt, which is followed after some seconds by a solution of Na_2S or better still Na_2S_2 or Na_2S_3 . The resultant color varies from brown to black according to the strength of the salt (one to five percent).

Phillips Thygeson.

Landegger, Georg. **A case of severe gelatinous scleritis.** *Zeit. f. Augenh.*, 1931, v. 76, Dec., p. 83.

After several attacks of scleritis a woman of forty-four years had an attack which continued for over six months. The uveal and orbital tissues became involved in the inflammation, although the cornea remained clear. At enucleation it was very difficult to separate the eyeball from the surrounding inflammatory tissue by sharp dissection. Muscle insertions could not be found. In the histological preparation the sclera was replaced by a very thick mass of organized inflammatory tissue.

F. Herbert Haessler.

Leoz Ortin, G. **The practice and biology of plastic operations.** *Arch. de Oft. Hisp.-Amer.*, 1931, v. 31, Nov., p. 593.

A pupil of Ramon y Cajal, the writer has for many years conducted experiments on transplantation of corneas and optic nerves. The neurotropic activity of segments of degenerating nerves as nerve grafts has been demonstrated. Nerve regeneration is considered a great factor in corneal transplantation, and careful coaptation of perpendicularly cut borders with sutures is stressed as the most important

factor in successful results. The presence of blood and fat is inimical to successful grafting, daily dressings and application of heat are recommended, homoplasty and heteroplasty are rejected, and only autoplasty is satisfactory.

M. Davidson.

Lugli, L. **Marginal corneal degeneration.** *Arch. di Ottal.*, 1931, v. 38, July-Aug., p. 449.

The clinical picture of the cases reported is similar to that of marginal dystrophy of the cornea, and presents characteristics similar to those of arcus senilis, the essential features being: (1) accumulation of fatty globules in the corneal lamellæ, (2) destruction of cement substance and stretching of the cornea, (3) extensive vascularization of both conjunctival and episcleral vessels, (4) absence of inflammation, and (5) presence of dysfunction in other organs, of endocrine and hormonal origin.

David Alperin.

Mariotti, C. **A contribution to the study of internal ulcer of the cornea.** *Arch. di Ottal.*, 1931, v. 38, Nov., p. 586.

This rare condition, in which an ulcer results from a break in the integrity of the membrane of Descemet, has been variously known as internal corneal ulcer, keratitis pustuliformis profunda (Fuchs), and deep central corneal infiltration. It is usually preceded by iritis and shows in the beginning a diffuse and circumscribed turbidity of the membrane, followed by a single or multiple gray, yellowish, or yellow infiltrates of varying size in the deeper structures of the cornea, either centrally or peripherally. A case is given in very complete detail with study as to its etiology and genesis. The author considers the possibility of the loss of tissue being of traumatic origin. As in other cases described in the literature the question of etiology is still unsolved.

Park Lewis.

Nugent, O. B. **The pathology and treatment of corneal ulcers.** *Jour. Amer. Med. Assoc.*, 1932, v. 98, Jan. 16, p. 207.

The author feels that sterilization of the necrotic area is most efficiently ac-

complished by the Birch-Hirschfield carbon-arc lamp. Regeneration of epithelial cells to cover the area is quite rapid. Scar formation is greatly reduced, and the resulting scar is thinner. (Discussion. Fourteen photographs.)

George H. Stine.

Peter, L. C. Dystrophy of the corneal epithelium: its recognition and clinical significance. *Arch. of Ophth.*, 1931, v. 6, Dec., pp. 817-822.

Careful search with ophthalmoscope and slit-lamp reveals many cases of corneal dystrophy. Three different types of endothelial change are outstanding; first, that observed after an iritis or iridocyclitis; second, that following trauma; third, true dystrophy of the endothelium. All cases should be studied by direct illumination along the line of specular reflection.

In the first type are seen a varying number of black pigmented spots lying upon endothelial cells of blurred outline and even surface. In the second group the changes are usually limited to the region affected. The endothelial mosaic varies in level, edema is marked, and evanescent black spots are seen. As a rule, the cells retain their hexagonal outline. The epithelium is usually involved. In the third group, the condition is permanent and bilateral, and begins in the center of the cornea. It can only be recognized in its incipency by the slit-lamp, when large, round black nonreflecting areas appear. Vision remains perfect. As the condition progresses to the second stage, the lesion advances toward the periphery and the endothelial surface takes on the appearance of beaten silver, the hexagonal cells become fewer, and a burnished silver network surrounding black nonreflecting areas can be seen everywhere. Vision falls, and the fundus details are seen with difficulty.

Dystrophy was found in the author's series in association with senile and nuclear cataract, being usually in patients over fifty years of age. This disease constitutes a serious complication in operative conditions, probably due to

the loss of vitality which underlies the lesion. There is no tendency to regeneration.

M. H. Post.

Ptashnik, D. G. Familial degeneration of the cornea. *Russkii Ophth. Jour.*, 1931, v. 14, July, p. 42.

Four cases of nodular dystrophy of the cornea (Groenouw) were observed in three generations of the same family. The slit-lamp revealed a tendency to grill-like distribution of the corneal opacities in some of the cases reported. This, in the author's opinion, proves the identical nature of the nodular and grill-like dystrophies. Some endocrine disorders (atrophic state of the thyroid, hypofunction of the ovaries) were found on general examination, but could not be definitely correlated with the corneal disease. *M. Beigelman.*

Reganati, F., and Favaloro, G. Acute pseudocyst of the cornea. *Ann. di Otal.*, 1931, v. 59, Aug., p. 722.

True cysts of the cornea are exceedingly rare. The first was described by Treacher Collins in 1891. A true cyst must arise from the deeper layers of the cornea or those superficial to it and must be lined throughout with epithelium or endothelium, and its contents should be either serum or blood. All corneal cysts lack individual walls, as these are formed from the corneal substance itself. Four cases of pseudocyst of the cornea have been recorded, and in each there was a perforating wound with iris adhesions. The involvement of the iris constituted a locus minoris resistentiae by reason of the obstruction to cicatrization and of ready imbibition of the intraocular fluid; association of possible hypertension making a ready communication between the anterior chamber and the interlamellar spaces and forming thereby a pseudocystic cavity. By further proliferation of the epithelium or endothelium the anterior chamber may be closed and the pseudocyst then becomes a true one, the true cyst being nothing other than a later development of the pseudoformation. (Bibliography.) *Park Lewis.*

Sallence. **Vitamin therapy in ophthalmology.** Arch. de Oft. Hisp.-Amer., 1931, v. 31, July, p. 386.

Good results in eczematous and tuberculous keratitis are reported from the use of the Lorencini vitamin, which contains vitamins A and D, and Viganol of Merck, combined at times with the use of polyglandular extracts.

M. Davidson.

Sallmann, L. **The histologic picture of gold deposits in the human cornea after tattooing.** Graefe's Arch., 1931, v. 126, p. 297.

After tattooing with gold chloride, deposits of gold were found in large amounts in the middle and deep layers of the cornea. The author describes the changes of the brown and blue-gray deposits into a ruby red form, probably colloidal gold, which is also found in anatomic preparations. The superficial formation of connective tissue pushed the discolored layers away from the epithelium; a pronounced vascularization indicated a severe irritation. Descemet's membrane unlike the membrana elastica anterioris showed a particularly intensive coloration just as in copper and silver impregnation of the cornea.

H. D. Lamb.

Spektor, S. **Clinical contributions to the etiology of bilateral relapsing erosions of the cornea.** Klin. M. f. Augenh., 1931, v. 87, Nov., p. 661.

The author reports four cases of spontaneous, nontraumatic, bilateral erosions of the cornea, which did not yield to any usual treatment. Entozoa (*ascaris lumbricoides*; except *taenia saginata* in one case) were discovered in all the patients. After their removal the affection healed promptly.

C. Zimmermann.

Vila Coro. **Scrofulous keratitis and antialpha.** Arch. de Oft. Hisp.-Amer., 1931, v. 31, Sept., p. 516.

Excellent results are reported from subcutaneous use of Ferran's antialpha serum (a tuberculosis serum), in preventing relapses after an eczematous keratitis.

M. Davidson.

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Adie, W. J. **Argyll Robertson pupils true and false.** Brit. Med. Jour., 1931, July, p. 136.

The author finds fault with the ordinary definition of the Argyll Robertson pupil. In referring to Argyll Robertson's original description he points out that this description implies more than the usual short definition of pupils that react to accommodation but not to light. The essential features of a true Argyll Robertson pupil are: a small pupil constant in size, unaltered by light or shade, contracting promptly and fully on convergence, dilating again promptly when the effort to converge is relaxed, and dilating slowly and imperfectly to mydriatics. Pupils which conform to the above definition are always due to syphilitic infection of the nervous system. A partial Argyll Robertson pupil is one in which the response to light is slow or incomplete but in which the other criteria are satisfied. There are a number of conditions which resemble a true Argyll Robertson pupil, but careful examination will show that the syndrome as given above is not complete. Chief among these are lethargic encephalitis, quadrigeminal tumors, fixed pupils, and pupillotonia. The differential diagnosis is given.

M. E. Marcove.

Baurmann, M. **Spectroscopic examination of the ocular fundus.** Graefe's Arch., 1931, v. 126, pt. 4, pp. 536-546.

The problem was to obtain exact information with regard to the oxyhemoglobin and reduced hemoglobin content of the blood in the choriocapillaris, by means of spectroscopic examination of the fundus. The work was carried out on eyes of normally pigmented and those of albino rabbits as well as on the human eye. There is a typical absorption spectrum from either oxyhemoglobin or reduced hemoglobin in the choriocapillaris, the former having two absorption bands, one in yellow and the other in green, whereas the bands for the latter lie

between those of the former. By using Gullstrand's ophthalmoscope it was possible to exclude from the spectro-scope all light except that reflected from the fundus. The difference in appearance of the fundus spectrum in normal and in albino rabbit eyes is essentially that in the former the reflection spectrum of the blood is received from reflected light and in the latter from transmitted light. The pigment itself seems to have but little effect upon the form of the spectrum.

E. S. Buss.

Car, A. Experimental observations on the action of extracts from endocrine glands upon the ciliary body, by means of the oxydase reaction. Graefe's Arch., 1931, v. 126, p. 436.

The principle of the biological oxydase reaction lies in the fact that in the cell, while vital combustion is taking place, alpha-naphthol and dimethyl-paraphenyldiamin in the presence of oxidising ferments are oxidised to indophenol-blue. Only albino rabbits were used. Fifteen hours before they were killed, 0.1 c.c. of the active substance was injected into the vitreous of the right eye of the rabbit; into the left, control, eye nothing was injected. After death each enucleated eye of the rabbit was fixed, sectioned, and stained by a special technique.

It was found after injection of adrenalin, of parathyroid extract, of glandutrin, or of insulin into the vitreous of the rabbit that the ciliary epithelium colored very faintly blue when tested by the oxydase reaction. The author thinks that these substances cause a disturbance in the supply and consumption of oxygen by the ciliary epithelial cells; this leads to less secretion of albumen in the second aqueous humor after paracentesis and a slower regeneration of aqueous. These substances therefore paralyze the ciliary epithelial cells and lead to a diminution of ocular tension.

Injection into the vitreous of extract of the thyroid, testis, or thymus, or injection of glanduovin, caused a definite blue coloring of the ciliary epithelium

with the oxydase reaction, the same as occurred in the ciliary epithelial cells of the control eye. *H. D. Lamb.*

Dor, L. The recovery of both eyes in sympathetic ophthalmia. Arch. d'Ophth., 1931, v. 48, Dec., p. 811.

A critical review of the literature yields the conclusion that a large number of well known ophthalmologists take the ground that when sympathetic inflammation has begun in an eye, the removal of the exciting eye has very little beneficial effect and should not be done if this eye has any vision, for in the end it may have the better vision. The writer believes that if fifteen days have elapsed since the accident it is too late to remove the injured eye. After that time one should attempt to cure both eyes by therapy of the usual nature, only removing the injured eye if it becomes painful or blind. One case is reported to illustrate complete recovery of vision in both eyes of an eleven-year-old child after active treatment with sodium salicylate, sulpharsenol, mercury, potassium iodide, vitamins, subconjunctival injections, and abscess of fixation.

M. F. Weymann.

Dymschitz, L. A. Case of unusually pronounced development of flocculi iridum. Graefe's Arch., 1931, v. 127, pt. 1, pp. 100-102.

In a man thirty-eight years old, having 3.5 D. of myopia, slit-lamp examination showed interesting anomalies of the pupillary fringe in both eyes. In the right eye the dark brown pupillary fringe around the entire circumference of the pupil was strongly developed. It was rough and studded with round, irregular, or sausage-shaped dark brown excrescences. A protrusion at its lower nasal quadrant was especially developed, and here it was curved into an S-shape, hanging free and oscillating on the anterior surface of the iris. In the left eye, the entire circumference of the pupil was bordered by a thin, moderately serrated pigment fringe; on the latter, above and below there were several

pigmented excrescences chiefly round in shape and of the same character as those in the right eye; in addition a long (6 mm.) rather thin, dark brown, pigmented strand hung down from the upper margin of the pupil and moved freely in the anterior chamber, extending vertically across the inner half of the pupil and the anterior surface of the iris below. This strand was covered by pigmented protrusions of round, club, or sausage shape.

H. D. Lamb.

Fischer, F. P. **The diffusion of hemoglobin against aqueous, vitreous and blood serum.** *Arch. f. Augenh.*, 1932, v. 105, pp. 430-442.

A forty percent solution of hemoglobin derived from rabbit's blood was used in diffusion tests against water, aqueous, vitreous, and blood serum. Both quantitatively and qualitatively, aqueous, vitreous, and blood serum diffuse much more slowly and to a lesser degree than water. Fischer feels that this has a bearing on the small amount of absorption of blood pigment by cornea, lens, and vitreous. In discussing the diffusion in vitreous, direct vitreous hemorrhages are excluded.

Frederick C. Cordes.

Jusefova, F. I., and Krol, A. G. **The use of atropin iontophoresis in ophthalmic practice.** *Archiv Oftalmologii*, 1931, v. 8, p. 296.

In twenty-three cases of iris adhesions in which the instillation of mydriatics was ineffective, atropin iontophoresis with Cantonnet's apparatus was used. In most cases partial or complete dilatation of the pupil was accomplished after three or four applications. It was also found that atropin iontophoresis had a distinct analgesic action.

M. Beigelman.

Osterberg, G. **Iridocyclitis with central scotoma.** *Acta Ophth.*, 1931, v. 9, p. 310.

The author reports a case of left-sided iridocyclitis with central scotoma and rise of tension in a woman seventy-one years of age. Six months after

the beginning of the disease the right eye showed evidence of iridocyclitis, and after administration of Tebeprotein this eye also developed a central scotoma. In seeking an explanation for the retrobulbar neuritis which caused the central scotoma, the author refers to Meller, who, in histological examination of an eye which was enucleated after iridocyclitis and central scotoma, found the inflammatory process extending from the ciliary body to the retina, and along the perivascular lymphatics of the retinal veins to the optic nerve; to Fuchs, who believed that the infection was carried by toxins from iris to disc through the hyaloid canal; and to Urbanek, whose four cases pointed to simultaneous hemogenous infection of iris and optic nerve.

Ray K. Daily.

Rossi, V. **Heterochromia iridis and tuberculous affections.** *Arch. di Ottal.*, 1931, v. 38, May-June, p. 367; and July-Aug., p. 369.

Rossi tries to show that eyes presenting heterochromia are susceptible to many ocular affections such as optic neuritis, glaucoma, choroiditis, uveitis, descemetitis, and cataract. Extirpation of the cervical sympathetic induces a true and essential atrophy of the chromatophore cells due to trophic disturbances, both from sympathetic paralysis and from myosis. The author also considers that low grade inflammations of the anterior uveal tract induce heterochromia and vice versa congenital heterochromia predisposes the individual to iridocyclitis. The article contains a report of four cases of noncongenital heterochromia; one postoperative case (serous iridocyclitis), two cases following chronic uveitis, and the fourth case following intense tuberculous uveitis.

David Alperin.

Samuels, Bernard. **Postoperative nonexpulsive subchoroidal hemorrhage.** *Arch. of Ophth.*, 1931, v. 6, Dec., pp. 840-851.

This report is concerned only with postoperative hemorrhages which oc-

cur under and do not rupture the choroid. Eight cases are reported. In almost every case severe pain was experienced during or after operation, and the eye was removed. As a rule, the blood does not undermine beyond the perichoroidal space, and usually comes to lie on the nasal or temporal side anterior to the equator. The iris and lens, the latter usually ruptured, are pushed forward into the wound. Necrosis of choroid and retina may follow. The vessels of the choroid in the posterior segment are usually greatly engorged. A membrane of connective tissue commonly forms about the hemorrhage, the rate of encapsulation varying inversely with the tension of the eye. Ordinarily the capsule is well formed in two weeks. It begins and is eventually thickest on the choroidal side. No strands extend from it into the hemorrhage, but it may be adherent to the choroid and sclera at the same time. The erythrocytes may remain unchanged for a considerable period of time, but in the end probably undergo chemical change, are dissolved and borne away by the tissue fluids. Eventually only a thickened membrane remains. The blood does not come from the choroidal vessels or it would be found in the choroidal stroma. It must arise from the long posterior ciliary arteries at their entry into the perichoroidal space. Other vessels may be torn by displacement. The rupture takes place as a result of the sudden lowering of intraocular pressure and is more prone to occur in cases of high tension or vascular disease. Transudation of serum comes on slowly, hemorrhage rapidly. Pain at first is due to the sudden stretching of a long posterior ciliary nerve, then to increased intraocular pressure, and finally to contraction of the newly formed tissue capsule about the nerves. Destruction of the eye follows from lack of blood supply, hypertension, and mechanical damage. Pseudosarcomatous areas may follow small hemorrhages and are seen as dark brownish areas of some elevation. To prevent such hemorrhages, the blood pressure

should be lowered as much as possible before operation, and the intraocular tension should be under control. Akinesis should be employed, the head should be well up, and the aqueous allowed to escape slowly.

M. H. Post.

Sondermann, R. **Critical remarks on the bloodpressure in the veins and capillaries of the uvea.** Graefe's Arch., 1931, v. 126, p. 621.

In a previous paper the author reported finding experimentally in the vorticos veins of rabbit's eyes a blood-pressure 25-30 mm. Hg. above the intraocular tension. In the present paper the author explains the seeming discrepancy between his findings and those of other observers in this field, particularly Seidel and Duke-Elder, and states that his results corroborate the essential conclusions of these authors.

H. D. Lamb.

Stilo, A. **Soluble phosphorus in the aqueous humor.** Ann. di Ottal., 1931, v. 59, Aug., p. 718.

As soluble phosphorus is understood that proportion that is soluble in an acid medium. Already seven forms of soluble phosphorus have been demonstrated in the aqueous. Different methods of procedure are compared and the conclusion reached that in the aqueous the greater proportion of phosphorus is in inorganic form, a small trace as a pyrophosphate, and a noticeable trace in the complex ethers. From this point of view is apparent the analogy to the blood plasma, which supports the contention that the aqueous humor like the cephalorachidian fluids represents a dialyzate of the blood plasma. (Bibliography.)

Park Lewis.

Veltishtshev, F. **A case of sympathetic ophthalmia following evisceration of the eyeball.** Russkii Ophth. Jour., 1931, v. 14, July, p. 56.

A severe sulphuric acid burn resulted in atrophy of the right eye. Three weeks after evisceration of the atrophic eyeball, the patient returned

with a plastic uveitis in the left eye. The stump of the eviscerated eye was removed. Free atropinization, urotropin by mouth, mercury inunctions, and intravenous injections of neosalvarsan were administered. The uveitis gradually subsided and in time the patient recovered normal vision. In the stump of the eviscerated eyeball, the author found a small particle of uveal tissue adherent to the sclera.

M. Beigelman.

Verhoeff, F. H. **The nature and origin of the pigmented streaks caused by separation of the choroid.** Jour. Amer. Med. Assoc., 1931, v. 97, Dec. 19, p. 1873.

From macroscopic and microscopic studies of two eyes showing pigmented streaks in the fundus, and of five eyes in which separation of the choroid still existed, Verhoeff concludes that pigmented streaks in the fundus resulting from separation of the choroid are entirely different in nature and origin from angioid streaks. Very fine pigmented streaks exist while the choroid is still separated. These are furrowlike creases in the surface of the choroid. They are not usually visible on ordinary ophthalmoscopic examination, but they may be seen in some cases at least by transillumination of the separated choroid through the sclera. All these creases disappear as such when the separation subsides. The permanent pigmented streaks seen after the separation has subsided are ridgelike thickenings of the pigment epithelium. The pigment cells composing the permanent streaks originally accumulate within some of the furrowlike creases existing while the choroid is separated. When the choroid becomes reapplied to the sclera and these creases are smoothed out the pigment accumulations are elevated, giving the appearance of streaks. (Photographs and discussion.)

George H. Stine.

Walichan, Sona. **The pathologic anatomy of endophthalmitis. Changes in the suprachoroidea and in the supra-**

choroidal space. Graefe's Arch., 1931, v. 126, p. 561.

The present study included twenty-four eyes, the majority of which were enucleated because of endophthalmitis; the latter having developed after trauma, not infrequently with a retained particle of iron or brass. Also included were two eyes with the histologic picture of sympathetic inflammation, an atrophic eye with melanoma, and a case of endophthalmitis after extraction of traumatic cataract. Changes in the suprachoroidea and in the suprachoroidal space were present in fifteen cases of endophthalmitis and in the two cases of sympathetic inflammation. According to the character of the changes in the suprachoroidea and in the suprachoroidal space, these cases could be divided into groups. The first group, of seven cases, showed a typical picture of endophthalmitis with inflammatory changes on the inner surface of the ciliary body and retina. No changes were present in the choroid, the suprachoroidea or the suprachoroidal space. The second group, of two cases, showed changes in the suprachoroidea, characterized by hyaline degeneration. The ten cases of the third group were characterized by detachment of the ciliary body from the sclera, with the dilated suprachoroidal space filled with hemorrhage, serous exudate, and so on. Hyaline degeneration in the walls of the choroidal bloodvessels was also demonstrated in these cases. The fourth group was characterized by the presence of new-formed connective tissue in the dilated suprachoroidal space.

H. D. Lamb.

Werner, S., and Adlercreutz, E. **A case of hemorrhagic iritis with increased tension, and purpura thrombopenica.** Acta Ophth., 1931, v. 9, p. 316.

A woman fifty years of age was admitted to the eye clinic at Helsingfors, for iritis with hyphema and increased tension; the case resisted intensive treatment for six weeks. At the end of that time the patient began to have subcutaneous and intestinal hemor-

rhages, and she died from the subsequent anemia within two weeks. A few days before her death she developed a painful fluctuating swelling of the parotids. The coincidence of hemorrhagic iritis and purpura is very rare, and the etiology offers a wide speculative field.

Ray K. Daily.

8. GLAUCOMA AND OCULAR TENSION

Car, A. **Muscle incarceration and its effect upon ocular pressure.** Graefe's Arch., 1931, v. 126, pt. 4, pp. 613-620.

A new antiglaucomatous procedure is suggested, which consists in transplanting a portion of a rectus muscle through the scleral wound either into the anterior chamber, into the vitreous, or into the suprachorioidal space. This operation could be made effective in the following way: The incarcerated muscle, as a more highly organized tissue, would not readily coalesce with the sclera. There is, in addition, the possibility that a part of the scleral wound would not be entirely filled by the muscle, so that a fistula would result, especially in the event of increased intraocular pressure. The tonometric measurements show that in several instances a decrease of pressure was obtained in the normal eyes of rabbits.

E. S. Buss.

Ferree, C. E., Rand, G., and Sloan, L. L. **Roenne's nasal step as studied with stimuli of different visibilities.** Arch. of Ophth., 1931, Dec., v. 6, pp. 877-900.

In order to determine accurately the limits of visibility throughout the field of vision, it is necessary to use stimuli of medium or high visibility in the more remote portions of the field and those of low visibility in the more central regions. Roenne's nasal step was located with one degree white on black in 57 percent, with 0.5 degree white on black or one degree white on grey in 85 percent, with 0.17 degree white on black in 45 percent, and with one degree red or one degree blue on grey in 80 percent. During the course of the disease the step may change in depth,

disappear, and reappear. The indentation may lie in upper or lower quadrant, or in both. With different stimuli steps may appear concentric or very irregular. The step may be considered as a contraction of the field, as a kind of scotoma, or as a depression of sensitivity over a large part of the upper or lower nasal half of the field. There appears to be no detectable connection between the step and the Bjerrum scotoma except in the advanced stages, but the Bjerrum scotoma usually appears in the same half of the field as that in which the step occurs.

M. H. Post.

Gennaro, Luciano. **Tutocaine in ocular tonometry.** Arch. di Ottal., 1931, v. 38, May-June, p. 302.

The author prefers tutocaine to cocaine and holocaine for the following reasons: (1) Five percent solution gives prompt anesthesia, has no effect upon the pupillary diameter, and is well tolerated by the patient. (2) it does not irritate the conjunctiva and cornea. (3) Having no influence upon the pupil, and consequently none upon intraocular pressure, it may be used in operations for iridectomy on glaucomatous eyes or on eyes predisposed to this malady.

David Alperin.

Gizedzielski, Jerzy. **The capsular lamella of the lens in glaucoma.** (Glaucoma capsulare Vogt.) Graefe's Arch., 1931, v. 126, p. 409.

Among 156 cases reported in the literature as showing a loosening and exfoliation of the anterior lens capsule, 90 or 57.6 percent had glaucoma. In 13 cases of his own, the author reports 17 eyes with capsular changes. In all but three cases (54, 60, 63 years old), the patients were seventy years old or more. In 12 of the 17 eyes showing the change, there was present an increased ocular tension. The capsular change occurs in three forms: (1) as fine, bluish-white, fluffy flakes at the iris-pigment seam; (2) upon the peripheral parts of the anterior lens capsule as a crown of superficial granular opacities associated with radiating notches and streaks; (3)

in the pupillary space as a slightly opaque homogeneous disc with rolled up margins. The first form of flaky deposit was always found by the author accompanied by atrophy of the pigment seam. Of the three forms of capsular change, the most frequently encountered was the peripheral membrane and the rarest was that at the center of the anterior capsule.

H. D. Lamb.

Hamburger, Carl. **Fundamentals of the doctrine of glaucoma.** Klin. M. f. Augenh., 1931, v. 87, Nov., p. 638.

Hamburger, with the aid of several other clinicians, studied the question whether the vitreous plays a rôle in glaucoma. The tension of glaucomatous and nonglaucomatous eyes was measured with the tonometer immediately before and after enucleation. With one exception the tension of enucleated nonglaucomatous eyeballs was zero, that of the glaucomatous, with two exceptions, positive, from sixteen to sixty percent of the amount measured before enucleation. The decrease of tension after enucleation is most likely due to loss of blood. This certainly takes place also in glaucoma, but the tension was distinctly measurable in almost all these eyes, more than probably due to swelling of the vitreous. This is supported by the clinical observation that after operation of acute and chronic glaucoma tension may remain high in spite of loss of aqueous (indicating, according to Hirschberg, a doubtful prognosis). On the other hand the softening of the eye in acute ciliary inflammation is probably due to decrease in the vitreous.

C. Zimmermann.

Heegaard, S., and Larsen, V. **On the metabolism of fluids normally and in glaucoma patients.** (Preliminary communication) Acta Ophth., 1931, v. 9, p. 302.

This is principally an investigation as to the effect on intraocular tension of one liter of water taken on an empty stomach. There was an immediate rise of intraocular tension in normal individuals, as well as in those affected with glaucoma. In normal individuals

the rise was between 2 and 4 mm., and disappeared within half an hour. In glaucomatous individuals the rise was quite pronounced, and lasted several hours. Patients with a marked rise in intraocular tension complained of foggy vision, colored rings, and ciliary pain. This may be used as a diagnostic test in cases of doubtful glaucoma. Because of the rise in tension glaucoma patients should be warned against drinking large quantities of fluid at one time.

Ray K. Daily.

Holst, J. C. **Results of tangential sclerectomy (Holth) and subconjunctival iridencleisis (Holth) in glaucoma simplex from 1920 to 1929 inclusive.** Klin. M. f. Augenh., 1931, v. 87, Nov., p. 602. (Tables.)

The time of observation was at least one year. After sclerectomy in 215 cases, good tension without miotics lasted at least one year in 81.9 percent, vision was the same or better in 59.3 percent, and tension was good and vision unaltered in 54.1 percent. After iridencleisis in 81 cases, good tension was retained without miotics in 75 percent, equal or better vision in 86.3 percent, and good tension and unchanged vision in 70 percent. The results of both operations are best if performed at an early stage. Cataract occurred much more frequently after sclerectomy than after iridencleisis, the chief reason apparently being that the function of the eye was preserved in most cases after iridencleisis. Diminished vision, probably due to cataract which had developed or increased after operation, was found at least three months after sclerectomy in 20 percent, and after iridencleisis in 7.5 percent.

C. Zimmermann.

John, I. **The action of subconjunctival injections of hypertonic salt solution on the glaucomatous eye.** Graefe's Arch., 1931, v. 126, pt. 4, pp. 592-600.

There is a sharp distinction in the reaction of eyes affected by simple glaucoma and those with chronic inflammatory and secondary glaucoma,

as regards the intraocular pressure changes after subconjunctival injections of hypertonic salt solution in dilutions of five to ten percent. The latter (chronic inflammatory and secondary glaucomas) react like normal eyes with a primary increase of pressure, which at times is higher than the values found so far in normal eyes, while the simple glaucomas seem to react frequently with a primary decrease of pressure. In chronic inflammatory and secondary glaucoma, moreover, initial pressure values are usually regained in about an hour, the pressure coming down; but in simple glaucoma the pressure sometimes stays down more than an hour.

The difference in behavior of simple glaucoma and other forms of this disease would not only point to a different origin of the disease, but would also indicate a different condition and reaction of the ocular blood vessels.

The contradictory results obtained by various clinicians in treating glaucoma can be explained on the basis of this variation in reaction to subconjunctival hypertonic salt solution. Further investigation must precede a decision as to whether the various stages of the disease could be differentiated by this method.

E. S. Buss.

Komarov, B. B. Elliot's operation for chronic glaucoma. *Russkii Ophth. Jour.*, 1931, v. 14, July, p. 38.

The author reports his observations in ninety cases of chronic glaucoma in which he did sclerocorneal trephining. In the early stages of glaucoma the operation was most effective. In the advanced period in which the visual acuity was below 0.1, Elliot's procedure failed to normalize the intraocular pressure in fifteen percent of the cases operated upon. In very few instances deterioration of the visual functions continued even after normal pressure was obtained. Komarov emphasizes the comparative frequency of late infections following Elliot's operation; these he encountered in four cases. Because of this, he prefers iridectomy whenever

the patient is not expected to take proper care of the operated eye, provided the intraocular pressure is below 35 mm.

M. Beigelman.

Rochon-Duvigneaud, A. Corneal trepanation with peripheral iridectomy in the treatment of chronic glaucoma. *Bull. Soc. Franç. d'Opht.*, 1930, p. 267.

Rochon-Duvigneaud treats surgically those cases of chronic glaucoma whose tension cannot be quickly and completely reduced by medical measures. He uses the operation of Elliot modified by reducing the iridectomy to a small peripheral buttonhole which remains hidden under the limbus. Two types of complication have been observed. The first consisted of a uveitis mild but capable of producing synechiae and pigment dust on the anterior lens capsule which could interfere with vision. This can usually be avoided by the instillation of atropin immediately after operation and its continued use for several days. If in spite of this the pupillary border tends to become irregular or wavy the use of mercurial frictions for eight or ten days is usually successful in preventing further progress. The other type of complication observed in three cases out of fifteen, consisted of retinal detachment which in every case involved the temporal retina, producing nasal narrowing of the visual field difficult to distinguish from that of the glaucomatous disease itself. The other cases have all been satisfactory. The author is unable to attribute the detachments to any particular action of the operation but considers them of the same order as those following other operative interventions on the eye.

Phillips Thygeson.

Rossi, V. The action of certain derivatives of choline on the normal and the pathological eye. *Arch. di Ottal.*, 1931, v. 38, Nov., p. 573.

Choline is an organic substance obtained from the blood, the urine, the cerebrospinal fluid, and other biologic sources. Its action on the eye is much like that of the physostigmin group. Various experiments were made on

animals and men by the use of choline and its derivatives locally applied in the eyes and hypodermically. In animals acetyl-choline was exceedingly toxic and was not neutralized by adrenalin. It lowered the ocular tension of rabbits when injected into the vitreous, and caused myosis, but did not produce these results when used hypodermically. In normal eyes when injected subconjunctivally it produced a slight reduction in tension which lasted for an hour, whereas in glaucomatous eyes it produced no reduction in tension but caused intense edema and pain. The conclusion is that it may be of use in preglaucomatous conditions but not after vascular changes have occurred.

Park Lewis.

Schmelzer, H. **The application of Nervocidin in ophthalmology.** Graefe's Arch., 1931, v. 127, pts. 2 and 3, pp. 414-431.

The writer checked the results of Ascher and Isa John in the use of Nervocidin for reducing intraocular pressure, with dilutions of 1 to 1000 and 2 to 1000 of the commercial preparation. When applied to the normal eyes of rabbits it produced: (1) hypotony, instillation having least, and subconjunctival and retrobulbar injection more, and injection into the vitreous most effect (even prolonged to eighteen days); (2) anesthesia and concomitant hypesthesia of the cornea; (3) injury proportionate to the hypotony, so that injection into the vitreous led to serofibrinous iritis with formation of synechiae.

In view of these results the author felt justified in applying this preparation by instillation only. In only one case of glaucoma simplex was Nervocidin as effective as pilocarpin in reducing the moderately elevated tension. In two cases, both pilocarpin and Nervocidin had the same reducing effect, which, being insufficient, necessitated surgical intervention. In two cases of glaucoma simplex Nervocidin caused a slight increase of intraocular pressure and in one case it caused temporary corneal opacity and hyperes-

thesia. Nervocidin is therefore not a remedy for glaucoma. It gives good service as an analgesic and anesthetic.

E. S. Buss.

Sondermann, R. **Contribution to the knowledge of the development of the iris angle and the adjacent structures.** Graefe's Arch., 1931, v. 126, p. 173.

The development of the iris, the trabeculae, and Brücke's ciliary muscle is uniform, and is from capillaries with interlying mesenchymal cells. The anterior iridoscleral veins usually run in compact tissue, although a portion remains free in the angle of the anterior chamber. The latter becomes separated by rarefactions, so that the separate parts become rearranged and form on one side an iris nodule and upon the other side the so-called anterior scleral ring. The scleral ring is never present as a circle but arises only in separate lengths; it is always present at or in the neighborhood of the apex of the angle and in the extension of the fragmented iridoscleral vein running from Schlemm's canal to the anterior chamber. The beginning of the sclera occurs in the scleral fibers which lie upon the inner side of the iridoscleral vein or of the sinus developed from it. These fibers later move slowly forward between capillary endothelial strings, running posteriorly from the uveoscleral trabeculae. The more pronounced development of the uveal network in many animals is due to the first trabecular fibers being developed thicker by the iridoscleral vein or that vein forming in its place after its obliteration by focal rarefactions. In rare cases in man the same cause produces larger spaces of Fontana; a condition which must be considered as atavistic in man. The structure designated as scleral or corneoscleral trabecular network is essentially formed from the uvea but in a small degree from the sclera and not at all from the cornea: the designation of uveoscleral network is accordingly more appropriate. The deeply lying Schlemm's canal develops from a vessel which branches from the iridoscleral vein.

H. D. Lamb.

Tello, N. **Modern trends as to the genesis of glaucoma.** Arch. de Oft. Hisp.-Amer., 1931, v. 31, July, p. 394.

The author reviews briefly the theories of ciliary hypersecretion and sympathicotonia, and those of increased capillary permeability, alkalosis, and retention (Knies). *M. Davidson.*

Werner, Sigurd. **The effect of subcutaneous injections of gynergen on the tension in glaucoma.** Acta Ophth., 1931, v. 9, p. 275.

After a review of the literature, the author reports his results in fifteen patients with twenty-five glaucomatous eyes. He used 0.5 cm. gynergen subcutaneously three times daily, for from three to seven days. Ten patients were treated with gynergen exclusively, and five were also treated with miotics. There was no diminution in the tension of fourteen eyes (7 simple glaucoma, 2 chronic inflammatory, 2 absolute, 1 juvenile, and 1 secondary). Twelve of these eyes were treated later with miotics with a good result in ten. In five eyes the intraocular tension was reduced (2 simple glaucoma, 1 chronic inflammatory, 1 congenital hydrophthalmos, 1 secondary) by an average of 11 mm. of Hg. The tension was reduced to normal only in one case of secondary glaucoma. In the six eyes treated simultaneously with miotics and gynergen tension could not be reduced to normal, even by subsequent operative procedures. In five eyes the effect of gynergen and miotics was no better than that of miotics alone. In one case of inflammatory glaucoma, gynergen reduced tension to 38 mm. Hg, while under previous repeated eserine instillations it stayed between 55 and 60 mm. Hg. The author concludes that the effect of gynergen administered subcutaneously is insignificant. *Ray K. Daily.*

Werner, Sigurd. **A clinical study on the effect of subconjunctival injections of gynergen on the intraocular tension in glaucoma.** Acta Ophth., 1931, v. 9, p. 286.

Subconjunctival injections of gynergen were tried in eighteen glaucomatous eyes, 0.5 c.c. being injected 0.5 to 1 cm. beyond the limbus, above and temporally. The resulting subconjunctival edema disappeared in several hours, but a slight local hyperemia persisted until the next day. The tension was taken before the injection, $\frac{1}{2}$ hour, 2 hours and 4 to 9 hours later, and the morning and evening of the next day. In fourteen of the eighteen eyes tension was reduced. The author concludes that a subconjunctival gynergen injection usually reduces tension and may bring it down to normal, the effect lasting one to two days. Most suited to this treatment is simple glaucoma. Gynergen is more effective administered subconjunctivally than subcutaneously, but even so it is not so effective as adrenalin or miotics.

Ray K. Daily.

9. CRYSTALLINE LENS

Butler, T. H. **Spontaneous cure of cataract.** Brit. Jour. Ophth., 1932, v. 16, Jan., p. 35.

The author adds another example to the following previously reported case: In 1914 he observed a mature cataract. In 1927 the patient complained of diplopia. Examination revealed a clear segment above, the nucleus having dropped down about one-third of the pupillary area. Attached to the anterior capsule was a third membrane, probably a remnant of the condensed lens tissue that covers the nucleus. Examination in 1930, sixteen years later, showed the nucleus sunk far down. With + 10.5 sphere + 0.5 cylinder axis horizontal vision = 6/9.

The second case was in an elderly patient upon whom preliminary iridectomy had been performed with no possible injury to the capsule. There was a marked inflammatory reaction which cleared perfectly. One month later the lens showed haziness. Six months later it was entirely absorbed. (Two illustrations.) *D. F. Harbridge.*

Daily, Ray K. **Intracapsular cataract extraction.** Texas State Jour. Med., 1931, v. 27, Oct., p. 426.

The authors describe the various types of intracapsular cataract operation and particularly the Stanculeanu-Török-Elschnig operation.

M. E. Marcove.

Ferrari, Aldo. **Subcapsular stationary opacity of the lens following direct contusion.** Arch. di Ottal., 1931, v. 38, July-Aug., p. 435.

This article contains a report of a small traumatic subcapsular stationary opacity, the rest of the lens being clear. The author attributes the formation of this lesion to the fact that the capsule, which is very elastic in children, did not rupture, and only the subcapsular epithelium was damaged, it in turn inducing destruction of the anterior lens fibers. *David Alperin.*

Hanssen, R. **A contribution to the pathologic anatomy of the lens (pulverulent cataract.** Zeit. f. Augenh., 1931, v. 76, Dec., p. 73.

In a fifty-seven-year-old woman a central cataract consisted entirely of very minute punctate opacities. A narrow cortical zone remained clear and sharply circumscribed against the opaque part. The cataract was extracted extracapsularly. In the histological preparation were seen innumerable multiform spaces with granular contents which corresponded to the opacities. In the periphery of the part of the lens involved, the demarcations of the fibers were very hazily defined.

F. Herbert Haessler.

Kadlicky, R. **Intracapsular extraction of cataract.** Bratislavske Lekarske Listy, 1931, v. 11, Sept., p. 390; also Ofthal. Sbornik, 1931, v. 6, pp. 61-68.

Intracapsular extraction is sometimes impossible because the capsule is so tense that it cannot be grasped with blunt forceps. The author discusses the question whether the clinical aspect of the cataract makes it possible to foretell the chances of success. He analyzes 169 extractions done without selection in the course of seven months, excluding traumatic cataracts. The usual method was intracapsular

extraction with peripheral iridotomy. In 23 percent of the total number it was not possible to grasp the capsule, 72.8 percent of this minority being intumescent cataracts, 34 percent immature cataracts, 33.33 percent cyclitic and hypermature cataracts, and 11.1 percent sclerotic cataracts. The capsule could be grasped in every case of mature cataract. The lens was easily removed intact in 87.5 percent of mature cataracts; in 52 percent of sclerotic cataracts; in 42 percent of immature cataracts; in 33.33 percent of the cyclitic and hypermature; and in 18.1 percent of the intumescent. The capsule was grasped but escaped in the wound in 38.1 percent of the sclerotic; in 24 percent of the immature, in 12.5 percent of the mature; and in 9.1 percent of the intumescent. The author concludes that the clinical picture does not indicate with certainty the result obtainable by the intracapsular method.

In order to avoid the influence of excessive softness of the eye in rendering more difficult extracapsular extraction, the author advises against the use of adrenalin in conjunction with local anesthesia. He deems retrobulbar injection necessary and adds two percent of percaïne to the usual two percent solution of novocaine, thus prolonging anesthesia for a period of six to ten hours, and so carrying the patient beyond the interval during which post-operative pain is likely to be experienced.

W. H. Crisp.

Lewis, Park. **Cataract in fresh-water fishes as a result of parasitical invasion of the crystalline lens.** Arch. d'Opt., 1931, v. 48, Dec., p. 801.

Reference is made to the work of Nordmann in discovering cataract due to diplostome invasion of the lenses of fish. Three cases of such cataract have been reported in man. The writer had the opportunity to examine the eyes of a number of rainbow trout, nine out of ten of which were affected with cataract. In all cases *Diplostomulum gigas* was found in the lenses, often in great numbers. The eggs of the para-

site are deposited in the intestines of flesh-eating aquatic birds. They are eliminated with the excrement into fresh water, which ruptures the enclosing membrane, and allows a ciliated form of larva to escape. This penetrates the nonresistant tissue of certain varieties of snail. In the snail are deposited eggs from which issue organisms with bifurcate appendages used for swimming. These later enter the body of a fish at any unprotected point, but six days after inoculation organisms are not found in any other tissue but the eye, and here principally in the lens. Changes then take place in the lens and lead to its opacity.

M. F. Weymann.

Meesmann, A. **Relation between "ultrared" cataract and glassblowers' cataract.** *Arch. f. Augenh.*, 1932, v. 105, pp. 268-287.

Meesmann was able to produce cataracts in pigmented rabbits by radiating the eye with small doses of ultrared rays. These cataracts developed as posterior polar opacities. Upon further exposure, a pennate opacity of the peripheral cortical fibers was formed. With large doses, flake-like opacities also developed in the anterior cortical fibers in the pupillary area. The author feels that these lenticular changes correspond to the changes found in glassblowers' cataract of the human eye.

Frederick C. Cordes.

Moretti, Egisto. **Heredity and senile cataract.** *Arch. di Ottal.*, 1931, v. 38, May-June, p. 289.

In discussing the most difficult problem in biology, that of heredity, the author mentions a few factors of importance in hereditary mechanism. These factors are as a rule predicated upon physicochemical alteration of the germ plasm, produced under certain circumstances, by biological and physicochemical agents which are a part of the pathological heredity of the individual. The family tree published in the article includes thirty-six members of which eight died young, and eleven members presented bilateral total cata-

ract at an average age of about sixty years.

David Alperin.

O'Brien, C. S. **Hyperglycemia in persons with advanced senile cataract.** *Jour. Amer. Med. Assoc.*, 1932, v. 98, Jan. 23, p. 284.

Of 218 patients with advanced senile cataract, it was ascertained that hyperglycemia existed in approximately one-half. It appears that abnormally high concentrations of sugar in the blood and body fluids may in many cases have a bearing on the etiology of cataract. (Discussion, nine tables.)

George H. Stine.

Stevenson, Walter. **Newer methods in cataract surgery.** *Jour. of the Iowa State Med. Soc.*, 1931, v. 21, July, p. 343.

The Smith operation is not favored because the use of expression tends to vitreous loss. Stevenson uses the erisiphake as modified by Green. Just before the corneal section he places a corneo-conjunctival stitch. He claims that in sixty extractions by this method he has lost normal vitreous but once. He does not use the method on patients under fifty years. Due to contact of the erisiphake with the posterior surface of the cornea, there is after twenty-four hours a dense opacity of the cornea because of the intolerance of Descemet's membrane to foreign bodies. This impairs immediate results, but by the time a dressing is left off the opacity has cleared.

Ralph W. Danielson.

10. RETINA AND VITREOUS

Adams, P. H. **Diabetic retinitis in a patient aged twenty-two years.** *Brit. Jour. Ophth.*, 1932, v. 16, Jan., p. 38.

Diabetic retinitis is commonly regarded as a late condition found in elderly diabetics and considered to be secondary to the vascular changes rather than to the diabetes as such. A male aged twenty-two years complained of pain in the right eye. On examination the pupil was found to be filled by a greyish exudate obscuring details of the iris. Examination eleven

days later showed yellowish areas of retinitis just above the macula and below the superior temporal artery, and also some fine flecks just below the macula. There was a small mossy hemorrhage. The left eye presented several small hemorrhages. There was no definite disease in the retinal vessels. Urine, specific gravity 1.015, sugar 22 percent, blood sugar 0.3 percent.

D. F. Harbridge.

Amsler, Marc. **Note on detachment of the vitreous body.** Bull. Soc. Franç. d'Opht., 1930, p. 315.

Amsler is convinced that detachment of the vitreous occurs much oftener than is commonly believed and is not recognized as such. He cites a number of cases observed by him, with drawings and photographs of the fundus findings. The author seems to feel that vitreous detachment may indicate a future retinal detachment but does not declare himself absolutely on this point. He also insists on the importance of entoptic images, particularly in myopes, and urges that when these are present a very careful search of the vitreous shall be made for signs of detachment. In concluding he states that vitreous detachment should be considered as an episode in the degeneration of the vitreous body which occurs in high myopia and in senility, and that this degeneration is secondary to disease of the choroid.

Phillips Thygeson.

Bailliart, P. **The effect on visual acuity of experimental compression of the eyeball.** Bull. Soc. Franç. d'Opht., 1930, p. 462.

When the globe is compressed by a force equal to the systolic pressure of the central artery of the retina, there results, after about twelve seconds in normal subjects and often longer in

hypertensive cases, a temporary but complete blindness. The perception of color disappears long before that of white light. When the force is equal to the diastolic pressure of the central artery the subject observes, when looking toward a white surface, a black line which displaces itself rhythmically with the pulse. The effect on visual acuity is at first very slight, but at the end of some minutes the trouble becomes exaggerated and the acuity diminishes considerably. The experiment cannot be continued longer than seven or eight minutes, because of the discomfort which it occasions. In both cases the explanation of the resultant phenomena lies in disturbance, complete or partial, of the retinal circulation.

But if very moderate pressure is applied to the globe a distinct though feeble improvement in the visual acuity is observed. Since this occurs equally in myopes or hyperopes, a change in refractive error can be ruled out. The probable explanation lies in the vasodilatation which occurs and which can be observed in the disc with the ophthalmoscope. The slight choroidal and retinal hyperemia then acts on visual acuity, as does hyperemia of the skin on the tactile sense.

The effect of decompression in normal subjects is almost nil except for a feeble hyperemia. But when the circulation is reduced as in chronic glaucoma the effect may be the closing off of vessels whose lumen is already reduced by sclerosis. This may serve to explain the scotoma or reduction of visual field which sometimes immediately follows a decompressive operation. It is thus wise to ascertain as nearly as possible the state of the retinal vessels before operation in a patient whose point of fixation is menaced by shrinking of the visual field.

Phillips Thygeson.

NEWS ITEMS

News Items in this issue were received from Dr. G. Oram Ring, Philadelphia; Dr. George H. Shuman, Pittsburgh; and Dr. M.F. Weymann, Los Angeles. New items should reach **Dr. Melville Black, 424 Metropolitan building, Denver**, by the twelfth of the month.

Deaths

Dr. John Farquahar Fulton, St. Paul, Minnesota, aged seventy-three years; died February first, of carcinoma of the bladder.

Miscellaneous

The Canadian provincial government has found a large amount of trachoma among the Indians of Alberta, and active steps are being taken to control it.

The Manhattan Eye and Ear Hospital, New York, was left a bequest of \$10,000 by the late Alfretta H. Gardner, and \$10,000 under the will of James Brentano Clemens.

Dr. William Mahoney, Boston, reported in the American Medical Association Journal of February twentieth, three cases of retrobulbar neuritis ascribed to a depilatory known under the trade name of "Koremlu."

The Lucian Howe prize, a medal to be given for the presentation of the best original contribution to the knowledge of surgery, preferably ophthalmology, will be awarded by the Medical Society of the State of New York. Essays must be submitted before May ninth to the Committee on Prize Essays, Medical Society of the State of New York, 2 East 103rd Street, New York City.

At the exercises commemorating the fifty-sixth anniversary of Johns Hopkins University on February 22, portraits of four past and present faculty members were presented to the University. Among them was one of Dr. William H. Wilmer, professor of ophthalmology of the School of Medicine and head of the Wilmer Ophthalmological Institute. The painting was the work of Mr. Frank O. Salisbury, London.

Appointments of associate clinical professorships in ophthalmology by the medical school of the University of Southern California have been accepted by Drs. Carl Fisher, A. Ray Irvine, Theodore Lyster, A. L. Macleish, George McCoy, Clifford Walker, and M. F. Weymann, with Dr. Weymann as acting head of the newly created department of ophthalmology. This year the school has first, second and third year classes, so that by the end of 1933 the fourth teaching year will have been established. Clinical work in ophthalmology will thus begin in the next school year.

Societies

The Los Angeles Society of Ophthalmology and Otolaryngology has elected the following officers for the year 1932: President, Dr. Frank Friesen; vice-president, Dr. Dean Godwin; secretary, Dr. F. H. Brandt; and secretary for ophthalmology, Dr. M. F. Weymann. The society is now following the

general policy of devoting alternate meetings to ophthalmologic and otolaryngologic programs. The membership numbers 104. Half the dues are being used for building up that portion of the library devoted to the specialties of ophthalmology and otolaryngology.

The Section of Ophthalmology of the College of Physicians of Philadelphia met on Thursday, March seventeenth. The program was as follows: Dr. H. Maxwell Langdon: "Intraocular sarcoma which filled the orbit before medical advice was sought." Dr. E. W. Spackman, by invitation, "Diagnosis of double perforation of the globe by injection of air into the space of tenon." Discussion opened by Dr. Warren B. Reese. Dr. Louis Lehrfeld, by invitation, "Observation on eighty-seven cases of vernal conjunctivitis." Discussion opened by Dr. Bernard P. Widmann. Miss Ida Teller, by invitation, "Allergic investigations on twenty-three cases of vernal conjunctivitis." Discussion opened by Dr. Alexander Clarke.

The midwinter meeting of the North Dakota Academy of Ophthalmology and Otolaryngology was held in Fargo, North Dakota, February 13, 1932.

Dr. A. D. Prangen of the Mayo Clinic addressed the academy upon the following subjects: Early management of strabismus; Operative treatment of strabismus; Problems and procedures in refraction.

The Association for Research in Ophthalmology announces the following program for its third annual meeting in New Orleans on May 10, 1932: *Light*. 9:30 A.M. 1. Eye strain and illumination; being an attempt to explain the ocular symptoms produced by faulty illumination. Walter B. Lancaster, M.D. 2. The principle of induction in color vision. Frank Allen, Ph.D. 3. The new science of seeing. Dr. M. Luckiesch, Director Lighting Research Laboratory, General Electric Company, Nela Park, Cleveland, Ohio. 2:30 P.M. 4. Light sense. Percy W. Cobb, M.D. 5. Ultraviolet light in ophthalmology. H. Rommel Hildreth, M.D. 6. The transmissive properties of tinted lenses. Dr. W. W. Coblentz, Bureau of Standards, Washington, D.C.

Personals

Dr. Edward B. Heckel, Pittsburgh, Pa., was elected an honorary member of the American Medical Association of Vienna during a visit to Europe last summer.

Dr. Luther C. Peter, of Philadelphia, has been invited to open the discussion on "The treatment of non-paralytic squint" at the coming session of the Oxford Ophthalmological Congress.

Dr. Thomas B. Holloway, of Philadelphia,